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SEA POWER FOR THE
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This thesis examines the developing capabilities of the Indian surface combatant force. The emergence of a powerful Indian Navy is of concern to the United States in view of the strategic importance of the Indian Ocean region and its potentially related effects on Western Pacific maritime security. This study examines the history, current and future capabilities of, and the political and industrial support for the Indian surface combatant fleet. Current and future Indian naval strategy is examined and intelligence indicators are presented to assist in determining the intent behind India's naval expansion. Finally, the implications of a capable Indian surface force for U.S. policy are examined and policy recommendations postulated.

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INDIAN SURFACE COMBATANTS: SEA POWER FOR THE 1990s

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ABSTRACT

This thesis examines the developing capabilities of the Indian surface combatant force. The emergence of a powerful Indian Navy is of interest to the United States in view of the strategic importance of the Indian Ocean region and its potentially related effects on Western Pacific maritime security. This study examines the history, current and future capabilities of, and the political and industrial support for the Indian surface combatant fleet. Current and future Indian naval strategy is examined and intelligence indicators are presented to assist in determining the intent behind India's naval expansion. Finally, the implications of a capable Indian surface force for U.S. policy are examined and policy recommendations postulated.

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EXECUTIVE SUMMARY

The Indian Ocean is of vital strategic importance to the United States.. 28 percent of U.S. oil imports traverse regional SLOCs, as do significantly larger percentages of the imports of allies, with whom the U.S. is economically interdependent. The development of U.S regional bases, establishment of the RDJTF and DESERT STORM operations, and continuing NCA-mandated forward presence of U.S. military forces, primarily naval forces, are all indicative of the strategic significance of the Indian Ocean region for the U.S.

The expansion of the Indian Navy in general, and surface force in particular, should be viewed with interest by the U.S. government. The Indian surface fleet has evolved from a coastal defense force to a blue-water fleet with developing power projection capabilities. India's naval victories in the 1971 war with Pakistan demonstrated to the Indian leadership the utility of naval forces in an offensive role. Well-funded national policies based on these perceptions have resulted in a steady improvement in the quantity and quality of the Indian surface fleet over the past 20 years.

The Indian surface fleet, currently centered around two V/STOL aircraft carriers, enjoys continued national political backing and is supported by a robust industrial infrastructure. Shipyards, national industry and an extensive R&D establishment provide a strong technical base for the development and deployment of naval systems. This industrial support has resulted in a steady increase in the number of indigenous systems fielded by the Indian Navy. Although still reliant to a large degree on foreign sources

for naval weaponry, the Indian surface fleet is steadily growing more self-sufficient in all other areas of naval procurement.

The Indian surface fleet is already significantly more capable than other regional navies. Increased numbers of combatants, carrier strike capabilities and strategic base locations allow the Indian surface fleet to exercise a growing degree of local sea control in waters adjacent to India. The Indian surface force remains vulnerable to air attack (primarily from a regional land-based threat), and currently lacks significant amphibious and logistics capability. However, programs are in progress to rectify these shortcomings.

Current Indian naval strategy emphasizes EEZ protection, monitoring of extra-regional navies, sea control in specified areas, and limited power projection . These areas will continue to be emphasized, but there are many indications that future Indian naval strategy will be more proactive and offensive in orientation, with the surface fleet playing a major role.

The regional reaction to India's naval expansion has been one of alarm and trepidation. Several regional nations have begun their own naval development programs in response and there exists a credible danger that a regional arms race could result. Continued U.S. presence is seen as both reassuring and desirable to avert creation of a power vacuum that India might try to fill. While the Indian fleet has moderate capabilities compared to those of the U.S. it could have significant utility in a regional allied role. A regional naval security arrangement involving the U.S. and India, as well as other regional nations, could help achieve mutual aims for ensuring the stability and security of the region. If that role is properly balanced with related policy concerns in the Western Pacific, the U.S. could even be in a

position to promote stability between India and China—a development that would be beneficial to all concerned parties.

The breakup of the Soviet Union has changed the power relationships in many parts of the world, including the Indian Ocean region. Diplomatic initiatives, which acknowledge India's emerging dominant regional position, could allow the U.S. to develop new security relationships to promote stability in this increasingly volatile stage of world events.

The nature of future Indian national and naval strategy is difficult to discern given the lack of an official articulation of India's regional goals. This thesis offers intelligence indicators to assist in the determination of whether Indian naval strategy is likely to be offensive or defensive in nature. With no official naval strategy by which to gauge India's regional aspirations, observers are compelled to assess India's naval intentions on the basis of rhetoric (which has been predominantly inflammatory in nature), its growing naval capabilities, and in particular, naval actions. Based upon these factors, India is apparently pursuing a quest for regional naval domination.

I. INTRODUCTION

A. BACKGROUND

"The Indian Ocean is the key to the seven seas. In the 21st century, the destiny of the world will be decided on its waters."

ADM Alfred T. Mahan, USN (Hahn, 1990, p. 9)

The Indian surface combatant fleet will continue to develop into a modern force capable of projecting maritime power in the Indian Ocean region and could have an impact on U.S. interests in the region. For centuries the Indian Ocean has served as a mercantile highway, facilitating commerce between East and West. As civilization has advanced, the percentage of the world's maritime trade that utilizes the Indian Ocean's 28 million square miles has steadily increased. Today, one quarter of the global maritime trade crosses the Indian ocean (Singh, 1987, p. 159). The Indian Ocean region (see Figure 1) is rich in strategic raw materials, including energy resources such as uranium, gas, and oil, as well as significant manganese, copper, nickel, cobalt, and molybdenum deposits. Several major sea lines of communication (SLOCs) between Europe, the Middle East, South Asia, Oceania, and the Far East pass through the Indian Ocean (Hahn, 1990, p. 9). The primary regional strategic interests of the U.S. are the uninterrupted flow of Persian Gulf oil (which represents 28% of U.S. petroleum imports and significantly larger percentages of imports of allies such as Germany and Japan), and a secure maritime commerce environment for the U.S. and allies with whom the U.S. is economically interdependent (Department of Energy, 1991). The development of the U.S. base at Diego Garcia, the establishment of the Rapid Deployment Joint Task Force (RDJTF) to respond to regional crises,

and the recent DESERT SHIELD/STORM operations are indicative of the strategic significance of the Indian Ocean region to the U.S.

Figure 1. Indian Ocean Region
Source: (Awati, 1990, p. 23)

India occupies a unique and strategically dominant position, physically and economically, in the Indian Ocean. The major SLOCs and 50 percent of the Indian Ocean are within 900 miles of India's 3000 mile coastline (Tellis, Autumn 1990, p. 43). India surpasses the other South Asian nations collectively in population, size, GNP, scientific and technological capabilities, and industrial capacity (Subrahmanyam, 1984, p. 163). This geographic position and national potential make India a key power in a region where stability and security are of great importance to regional and extra-regional nations alike.

For much of the period since gaining independence in 1947, India has focused primarily on its land borders, and defense policy has been oriented to deal with perceived land-based threats from China and Pakistan (Rais, 1990, p. 39). In recent years, however, India has embarked on an ambitious naval development program and has demonstrated a renewed commitment to becoming a significant, if not dominant, regional naval power. Former Prime Minister Nehru explained India's naval views when he stated "We have once again realized the importance of the sea and, therefore the importance of the Navy. We cannot afford to be weak at sea...to be secure on land, we must be supreme at sea" (Hahn, 1990, p. 10).

India's naval expansion has led to concern by many littoral nations in the area as to the purpose of an Indian naval force far superior in numbers and capability than many believe are required for strictly defensive missions. As a superpower that considers the security of the Indian Ocean one of its vital national interests, the United States should also be concerned with the emergence of a strong Indian navy and examine the possible consequences

that enhanced Indian naval capabilities may have for near and long-term regional security and stability.

B. PURPOSE

The purpose of this thesis is to provide an unclassified intelligence assessment of the most visible and dramatically improved component of the Indian navy, the surface combatant force. The current and projected capabilities of the Indian surface force, trends in Indian ship design and development, and the role of the surface fleet in Indian naval strategy are examined to determine indicators which may point to India's ultimate maritime goals in the Indian Ocean region. This thesis also examines the implications that the development of the Indian surface force and its power projection capabilities may have for U.S. naval policy in the region and the potential that this force possesses to affect U.S. security interests in the Indian Ocean.

C. ORGANIZATION

Chapter II of this thesis reviews the Indian Navy's development from 1947 to the present. The structure and role of the surface force in India's four wars and various regional interventions is examined to determine how these factors have evolved over the past four decades. Trends in ship design and weapons capabilities also are addressed to determine what direction the surface force is likely to follow for the future.

Chapter III addresses the current and projected capabilities of the Indian surface force. The major surface combatants (carriers, destroyers, frigates, and corvettes) along with amphibious and logistic support vessels are examined.

Chapter IV examines the industrial support for the development of India's surface force, including shipyards, national industries, and research and development (R&D) to determine the degree to which the Indian public and private sectors are committed to continuing and expanding naval modernization and development.

Chapter V assesses the strengths and weaknesses of the force relative to potential regional adversaries. This assessment is based on unclassified material, knowledge acquired by the author during study in the Technical Intelligence curriculum, and the author's six years of experience as a Surface Warfare officer. An assumption of this study is that the myriad of regional small combatants (missile boats, patrol boats, etc.), although possessing a significant coastal defense capability, do not, unless forward-based, possess the range and endurance for extended offensive power-projection operations and therefore will not be addressed in depth.

Chapter VI discusses current and projected Indian naval strategy and the role of the surface force in this strategy. The influence of the Indian political process is discussed and intelligence indicators are presented to aid in determining whether India's future naval policy is likely to be offensive or defensive in nature.

Chapter VII addresses regional reactions to India's naval expansion, the implications of this expansion for the U.S. and recommendations for U.S. regional policy.

D. METHODOLOGY

This thesis evaluates the Indian surface force as a component of the "sea force" aspect of Indian maritime power. The other components (i.e.,

submarine force, land-based air) are not specifically addressed in this study. Technical evaluation of present and future force developments is based on design trends and on content analysis of Indian government and naval literature. The potential effectiveness of the Indian surface force is evaluated in terms of the model for medium naval powers as developed by RADM J.R. Hill in *Maritime Strategy for Medium Powers*. The surface fleet capability is assessed in the following areas:

- Normal conditions
- Low intensity operations
- Higher level operations

The source material for this thesis is from open literature, as well as from interviews with defense analysts and authors. Primary Indian sources are utilized wherever possible.

II. INDIAN SURFACE FORCE DEVELOPMENT

A. EARLY DEVELOPMENT

Over the last four decades the Indian Navy, currently one of the largest and most capable navies in the world, has progressed from a mediocre coastal defense organization to a modern offensively capable "blue-water" force. The present Indian Navy traces its roots to the Royal Indian Navy. The Royal Indian Navy was subordinated to the British Royal Navy prior to Indian independence and played only a minor role during the Second World War. Consequently, the Indian Navy, which officially came into existence in 1950, inherited little combat experience and naval tradition from its predecessor. The Indian Navy did, during the first two decades of its existence, possess a distinctive Royal Navy character. Many Indian officers had been trained in the United Kingdom and had served under British command during the Second World War. Most of the senior leadership were graduates of Royal Navy staff colleges. Additionally, many of the enlisted personnel had received varying degrees of Royal Navy training (Larus, 1981, p. 78). The initial surface force acquisitions of the Indian Navy were several aging British cruisers and destroyers, with additional frigates being added throughout the 1950s. The marginal capabilities of these ships (at best limited coastal defense), combined with the lack of a significant maritime threat, resulted in a naval force that had little reason for existence, let alone expansion. No significant mission was articulated for the Indian Navy except that a token

naval presence was desirable for the sake of national pride (Thomas, 1986, p. 152).

The years between 1947 and 1965 were marked by neglect for the Indian Navy. Many government officials saw no justification for a navy and felt that appropriations to that end were a luxury that could not be afforded. Another factor that stunted the early growth of the navy was the fact that India's early conflicts (Indo-Pakistani War of 1947, Sino-Indian War of 1962, and Indo-Pakistani War of 1965) were primarily land and air battles with no role played by the Indian navy. As a result the navy consistently received lowest priority in defense appropriations and lacked the prestige of its sister services (Larus, 1981, p. 78). The only development of note was the acquisition in 1961 from Britain of the light carrier *INS Vikrant* (ex-*HMS Hercules*). The *Vikrant* was purchased with sterling assets left in India by the Royal Navy for the specific purpose of acquiring naval assets from Britain and was not the result of any real appreciation of the need for a powerful navy (Tellis, 13 August 1991). With few assets available to escort the new carrier, the Indian Navy remained an essentially defensive force and the halt on funding that resulted from the 1962 Sino-Indian War prevented any further expansion (Singh, 1987, p. 6).

The Indian Navy took its first steps towards modernization following the 1965 war with Pakistan. During that conflict the Indian fleet was caught unprepared and lacked the doctrine and capabilities (as a result of the low funding levels) to interdict Pakistani warships. Consequently, a Pakistani surface group raided several Indian ports and installations virtually unchallenged (Tellis, Part I 1990, p. 84). Although the war was decided on the land, this perceived poor performance by the Indian Navy resulted in a

directive from the Indian Ministry of Defence to the Naval Chief of Staff to begin procuring new and modern ships. Britain, the heretofore traditional source of Indian naval procurement, authorized the licensed production in India of *Leander* class frigates. This had been preceded, however, by several Western rejections to Indian overtures regarding naval procurement (Thakur, 1990, p. 9). These rejections were primarily the result of a Western arms embargo imposed on the Indian sub-continent after the 1965 war (Thomas, 1989, p. 190). Indian naval planners, as a result, had begun to look elsewhere for naval acquisitions. Due to India's political shift towards Moscow, the Soviet Union was approached and a naval assistance agreement was signed in 1965. As a result, during the period 1965-77, India became the primary beneficiary of Soviet naval exports. The surface fleet benefited immediately with the acquisition of *Petya II* class frigates and assorted missile boats that provided a significant increase in capability (Larus, 1981, p. 78-79). Soviet assistance was also provided in the development of a new shipyard at Vishakhapatnam on India's eastern coast. The structure of the fleet underwent significant change during this period. In 1966 the naval leadership laid plans for the development of a modern two-fleet navy. These plans were manifested in 1968 with the formation of the Western Fleet (based at Bombay) and the Eastern Fleet (based at Vishakhapatnam). The naval leadership launched a program intending naval forces to be procured from overseas initially with indigenous construction to be expanded to supplement and eventually replace foreign acquisitions (Singh, 1987, p. 7). To support the developing fleet, maintenance and construction capabilities were significantly improved by expanding and modernizing the shipyards at Bombay and

Calcutta, the major Ministry of Defence shipbuilding facilities (Thomas, 1976, p. 502). By 1971 the Indian surface fleet had become more balanced and capable. The most significant units included the following:

- 1 carrier
- 2 cruisers
- 3 destroyers
- 3 destroyer escorts
- 16 frigates (with 3 *Leander* class under construction)
- 6 *Osa* I class missile boats
- 4 amphibious vessels

The Indian Navy, however, was still of lesser status than the Indian Army and Air Force and had yet to prove itself in battle. That opportunity finally came in the 1971 Indo-Pakistani War.

The Indian Navy in general, and the surface force in particular, enjoyed a great deal of success during the 1971 war. The missions assigned to the two fleets consisted of:

- Destruction of Pakistani maritime forces
- Disruption of Pakistani trade and protection of Indian trade
- Strikes against Pakistani military shore targets
- Blockade of East Pakistan (Kaul, 1973, p. 188)

To varying degrees, all of these missions were accomplished. Indian naval aviation made its combat debut as air strikes from *Vikrant* were directed at the ports of Chittagong and Cox's Bazar in East Pakistan (now Bangladesh), inflicting damage on Pakistani gunboats, merchant vessels, and oil storage facilities. The naval blockade of East Pakistan which was imposed by the *Vikrant* battle group and additional surface forces successfully

prevented the evacuation of Pakistani forces. The surface force also played an offensive role in the Arabian Sea, as a group of *Petya II* class frigates and *Osa* I class missile boats executed a bold missile strike (the frigates towed the missile boats to within striking range) at the port of Karachi in West Pakistan. Several oil storage tanks and Pakistani warships were destroyed or damaged (Kaul, 1973, p. 189-92). As a result of these actions, the Pakistani surface fleet remained in port and played no significant role in the conflict. At the war's conclusion, Pakistan had lost six warships (33% of total force) and 43 merchant vessels had been sunk or captured. The Indian Navy lost only one destroyer (*INS Khukri* was sunk by a Pakistani submarine) during the conflict (Sojka, 1983, p. 8).

The 1971 war marked a major turning point for the Indian Navy. Although the naval war had been conducted against a numerically inferior adversary and Pakistani air power had been neutralized rapidly by the Indian Air Force (more through good fortune than coordinated planning), allowing the Indian Navy to operate virtually unopposed, the naval victory greatly boosted the confidence and image of the navy. The Indian Navy had vividly illustrated the value of pursuing an aggressive naval strategy and demonstrated that it had a significant role in national defense (Tellis, Part I 1990, p. 85). The navy also learned negative lessons from the conflict. The sole amphibious operation attempted was a total failure. The operation (an attempt to land near Cox's Bazar) was unopposed but hurriedly conceived and was attempted on a beach that was unsuitable for an amphibious landing (Kaul, 1973, p. 189). Additionally, India's weakness in relation to foreign powers was demonstrated by the "gunboat diplomacy" of the aircraft carrier

USS Enterprise, which entered the Bay of Bengal during the conflict. The perceived threat of this deployment angered the Indian government and gave added validity to the desire of the navy for additional modern warships (Conboy, 1988, p. 1). With the exception of these latter events, the 1971 war was clearly the Indian Navy's finest hour and marked the starting point for a period of dramatic naval expansion and modernization. As stated by Commodore Ranjit Rais, IN (ret.), the early 1970s was "...a time when Indian naval professionalism evolved an identity of its own..." (Sassheen, 1988 p. 112)

B. FORCE DEVELOPMENT (1972-91)

1. Budgetary Trends

For all of its existence the Indian Navy has ranked a distant third in funding priority behind the Army and Air Force. Nevertheless, the funding levels for the Navy as a percentage of the defense budget has steadily increased since the mid-1960s (see TABLE I).

TABLE I. INDIAN NAVAL BUDGET AS % OF DEFENSE BUDGET

YEAR	1962	1967	1972	1977	1982	1987	1990
%	7.9	4.2	7.0	9.0	11.0	12.5	13.5

Source: *Indian Defence Review 1988 & Government of India Ministry of Defence Annual Report 1988-89*

Of additional significance are the increases in the navy's capital share of the defense budget. This had increased from 8% in 1970 to 52% by 1977 and remained at approximately that level through the 1980s (Thomas, 1986, p. 191). In terms of capital allocation, the Indian Navy and Air Force, both

capital intensive services, apparently reversed the positions occupied in the 1960s—an indication that the necessity for a capable naval force had become apparent to the political leadership (Thomas, 1976, p. 503). Although the percentage of the defense budget and capital allocations have remained roughly steady during the past two years as a result of national fiscal problems, the Indian government appears committed to maintaining an effective naval force. Indicative of this view is the April 1990 statement of then Prime Minister Singh, who asserted that allocations would continue to be made for the growth and modernization of the Indian Navy despite financial problems (Singh, 1990, p. 34). Public statements of this nature, expressing support for naval growth, have been made by each of India's leaders since the early 1960s and have been supplemented by real-term funding increases over the past 20 years.

2. Surface Combatant Development

The major surface combatant development during the 1970s was the addition to the fleet of the *Leander* class frigates. These capable ASW vessels were the first major warships to be built in Indian shipyards and have a 60% indigenous component. The *Leander* class were the first examples of the Indian proclivity for combining systems from many nations in a single hull. These vessels, for example, feature Soviet SSMs, Canadian sonars, British SAM systems, and multinational radar systems. These ships were the Indian Navy's first real exposure to modern, capable warships (Sharpe, 1990, p. 267). During the 1970s the Indian Navy continued to add additional Soviet vessels to its inventory. Specifically, four additional *Petya II* class frigates were delivered from 1972-74 (bringing the total to six) and three *Nanuchka II class*

corvettes were procured from 1976-78 (Sharpe, 1990, p. 269). Although these vessels were several years old at the time of purchase they did provide an improvement in capability for the navy.

The Indian Navy's preference for Soviet ships (which provided a modern capability at a relatively inexpensive price) was clearly demonstrated in the 1980s, a decade of remarkable expansion and growth for India. The introduction in 1980 of the first of five *Kashin II* class destroyers greatly enhanced the offensive potential of the navy. These ships became and remain the nucleus of India's surface combatant force. The Indian Navy also added two Soviet *Pauk II* class corvettes (with three additional units expected) in 1989-90 and five *Tarantul I* class corvettes during the period of 1987-90 (seven additional *Tarantuls* are on order with as many as 24 units total planned) (Sharpe, 1990, p. 268-69).

The most dramatic aspect of surface combatant development in the 1980s was that of Indian indigenous warship production. The Indian naval leadership desired to improve India's warship design and construction capabilities in order to gradually reduce reliance on foreign sources. The first major program was the construction of the three *Godavari* class frigates during the period 1983-85. These vessels were a modification of the *Leander* design and consisted of 72% indigenous content. This class is considered to be so successful that it is to serve as the basis for three follow-on frigates (Project 16A) planned to be in service beginning in 1994 (Sharpe, 1990, p. 266). Additional indigenous construction capability was displayed in the development of the *Khukri* class corvettes. These vessels (two commissioned with four building) are designed as replacements for the aging *Petya II* class

frigates. The indigenous content of the *Khukri* class is approximately 65% and, like the *Godavari* class, this class will serve as the basis for follow-on construction (Sharpe, 1990, p. 269). As of 1991, the Indian major surface combatant force consists of 55% Soviet, 26% British, and 18% Indian vessels. As older ships are retired, the percentage of the fleet that is of Indian construction will increase substantially. The Indian fleet is getting younger as well as more capable with the average age of Indian surface combatants having decreased from 17 years in 1974 to 11 years in 1990. Additionally, the combat tonnage of the surface combatant force is second only to China when compared with regional navies (see Table II). A list of the surface combatants is included in Appendix A.

TABLE II. REGIONAL SURFACE COMBATANT TONNAGE

YEAR	INDIA	PAKISTAN	CHINA	AUSTRALIA	INDONESIA
1974	88513	23186	47660	60850	20670
1978	89119	27886	61260	57250	17200
1982	93622	38756	93340	64732	15190
1986	86982	30561	133510	42066	29012
1990	122742	60440	123200	43202	33512

Source: *Jane's Fighting Ships (1974-1990)*

3. Naval Aviation Development

The capabilities of Indian carrier aviation have increased substantially in the period since the 1971 war. The employment of carrier aviation in the 1971 conflict, combined with observations of the effectiveness of carrier aviation in the Second World War and the Falklands, convinced

the naval leadership that a surface fleet centered around the aircraft carrier was the force structure of choice. This sentiment has continued to be echoed in the Indian naval literature to the present (Prakash, 1990, p. 63). The first notable event was the replacement of the older aircraft of *Vikrant*'s air wing with the British Aerospace *Sea Harrier* VTOL fighter. The first of these aircraft were accepted by the navy in 1983 (Tellis, 1989, p. 141). The *Sea Harriers* represent a major advance in the Indian Navy's capability for both fleet air defense and maritime strike. The second major event was the acquisition of *INS Viraat* (ex-*HMS Hermes*) in 1987 after an extensive refit. The *Viraat* has the capacity for eight more *Sea Harriers* than *Vikrant* and replaced the *Vikrant* as flagship of the fleet. The presence of a second carrier has considerably improved the tactical flexibility and strike capability of the Indian Navy. According to Indian naval sources, in 1987 the Indian Chief of Naval Staff stated that the addition of *Viraat* to the fleet marked "the beginning of a true blue water capability" for the Indian Navy (Singh, 1991, p. 43). Acquisition of an additional carrier to replace the aging *Vikrant* is currently being considered by the Indian government. While details of the design are unavailable in the open press, a French design firm is working with India to develop plans for a carrier similar in size to the *Charles de Gaulle* class carrier being built for the French Navy (Sharpe, 1990, p. 264). Additionally, the Soviet Union recently announced its intention to offer the supersonic YAK-141 V/STOL aircraft to India as a potential replacement for the *Sea Harriers* as they age (Cook, 1991, p. 1164). The impressive performance of the YAK-141 reported in the press indicates that this aircraft could greatly surpass the *Sea Harrier* in terms of performance and payload

and would give the Indian Navy an enhanced carrier strike capability (Barrie, 1991, p. 42-3). The Indian Navy is also evaluating a naval variant of the MIG-29 and of the developing Indian Light Combat Aircraft (LCA) as possible *Sea Harrier* replacements (Tellis, Part II 1990, p. 37). The almost universal advocacy in Indian literature for maintaining a fleet aviation capability indicates that the Indian Navy will continue to field a surface combatant force centered around carriers for the immediate foreseeable future.

The other major improvement in Indian shipborne aviation has occurred with the expansion of naval helicopter capabilities. Beginning with the acquisition of the Westland *Sea King* Mk 42 ASW helicopter in 1970, the Indian Navy has considered helicopters as an integral part of the carrier airwing and an essential capability to be included in surface combatants. Naval helicopters of British, Soviet, French and Indian design are currently active in the Indian fleet. The *Kashin II, Godavari, Leander, Whitby,* and *Khukri* classes are all helicopter-capable. Indicative of the importance placed by the Indian Navy on helicopter capabilities is the fact that the percentage of helicopter-capable ships in the inventory has risen from 10% in 1974 to almost 50% in 1991. The current Indian development of the Advanced Lightweight Helicopter (ALH) indicates that shipborne helicopters will continue to be an integral part of the Indian Navy (Sharpe, 1990, p. 269). A summary of Indian shipborne aviation assets is provided in Appendix B.

4. Amphibious Force Development

Although the development of the amphibious forces has not been as spectacular as that of the surface combatant and naval aviation forces, the Indian Navy has steadily improved its amphibious lift capabilities during the

past 20 years. During the period 1975-76, the navy acquired four *Polnochny C* class LSMs from Poland. Construction of seven *Vasco de Gama* class LCUs began in 1978 with the last unit being delivered in 1987. In the mid-1980s, the Indian Navy took delivery of four *Polnochny D* class LSMs from Poland and commissioned the first *Magar* class LST (loosely based on the British *Sir Lancelot* design) the largest ship constructed in India. While the current amphibious force of 16 landing craft does not constitute an overwhelming capability, it does reflect a significant improvement over the few such craft available in the 1971 war (Sharpe, 1990, p. 271-72).

The Indian Navy's amphibious forces have enjoyed little operational experience since the 1971 war. The lack of naval gunfire support and regional geography have combined to make the employment of these forces impractical in anything but peacekeeping roles. The interventions in Sri Lanka and the Maldives were accomplished with the Indian Army providing the manpower and the Indian Air Force providing the airlift (Tellis, 1991). There was no real opportunity for the Indian surface fleet to play a significant role, although, during the Maldives intervention, the *Godavari* intercepted and boarded the merchant ship that was escaping with the mercenaries who had initiated a coup attempt (Prakash, 1988, p. 49). The small (1000 man) marine brigade is trained primarily for installation protection, not amphibious assault. Additionally, the Indian Army provides most of the amphibious troops to the Navy a situation that makes training and coordination difficult. If India is to have the capability to protect its many territorial islands (an oft-stated naval objective), an expanded and trained amphibious force will be necessary (Tellis, Part II 1990, p. 41).

5. Logistic Support

The afloat logistic support capability for the Indian Navy has not developed as rapidly as other components of the fleet. The current underway replenishment capability is provided by two *Deepak* class oilers acquired in 1967 and 1975 from Germany. These vessels are chartered to the Indian Navy by the civilian company that paid for their construction, which the navy could not afford. This is indicative of the past low priority given to replenishment ships by naval planners. These vessels are capable of alongside and astern refueling, as well as dry cargo transfer. Five additional support tankers round out the logistic capability of the surface fleet. These vessels are not capable of traditional underway replenishment operations but do provide a fuel "shuttle" capability to augment the replenishment ships. The future plans for replenishment vessels currently consist of one replenishment and repair vessel of German design under construction at Calcutta. This vessel is similar to the *Deepak* class but with additional repair capabilities provided. Construction was started in 1987 and the ship should be completed by 1992 (Sharpe, 1990, p. 273).

As one Indian naval writer observed "Any naval growth, unaccompanied by the creation of support facilities and bases capable of sustaining fleet movements in a particular theater of operations, will ultimately be transformed into a brittle expansion that severely impedes deployment and retards operations." (Tellis, Part II 1990, p. 43) In this aspect the Indian Navy has decidedly shown significant modernization and expansion of support facilities. The most dramatic example of this expansion has been the modernization of the facilities at Port Blair in the Andaman

Islands. The development of this facility, which sits astride the Malacca Straits, was authorized in 1973 to "serve as a focal point for the defence of the eastern coasts..." (Singh, 1987, p. 10) Additionally, major shipyard capabilities are present in Bombay, Goa, Calcutta, and Vishakhapatnam. A major port facility is under development at Karwar that will be capable of providing support to aircraft carriers and other combatants (Grazebrook, 1987, p. 58). The base and logistic support that these facilities provide to the Indian surface fleet will continue to be improved and modernized over the next few years.

6. Ship Design and Weapons Trends

The Indian surface fleet has made many improvements in ship design over the past 20 years. A major preference has been demonstrated for gas turbine engines over steam propulsion. In 1971, the majority of the fleet was steam powered. By 1990, over 50% of the surface combatant force was powered by gas turbines. The reliability, responsiveness, and ease of maintenance of these engines apparently appeal to the Indian naval leadership. The *Petya II*, *Tarantul I* and *Kashin II* classes all feature gas turbine propulsion. When gas turbines are not practical, Indian designers have utilized modern diesel propulsion systems. These systems are featured in the *Khukri*, *Pauk II*, and *Nanuchka* classes. The Project 15 destroyers (India's newest destroyer class) are planned to utilize combined diesel and gas turbine (CODAG) propulsion-technology that represents the state-of-the-art in non-nuclear propulsion. (Sharpe, 1990, p. 265-69)

The weapon systems trend in the Indian surface combatant force has been toward greater utilization of missile technology. Both SSMs and SAMs have received greater priority since the 1971 war. Currently, 68% of the

principal surface combatants in the Indian Navy have SSM capability. This contrasts sharply with the non-existence of this capability (with the exception of short range patrol craft) in the early 1970s. All new construction surface combatants will have SSM capability. The number of SAM systems added to the Indian fleet has also increased over the past two decades. Currently, over 70% of the surface combatants have SAM systems, as opposed to less than 10% in the 1970s (Sharpe, 1990, p. 265-69). Although these systems are short range by Western standards, they do add significant air defense capability to the surface force. These trends, combined with the move toward modern propulsion systems, indicate that the Indian Navy is committed to acquiring a capable and reliable force that has the ability to go in harm's way.

The Indian surface force has had very little operational experience other than exercises since the 1971 war. The interventions in Sri Lanka and the Maldives were essentially land and air operations and presented little opportunity for the navy to play a decisive role, although they were indicative of an Indian willingness to assume the role of regional "policeman." The Indian surface fleet is, however, definitely a formidable and capable fighting force. The modernization and development of the surface force will likely continue well into the next century, and the Indian Navy will endeavor to remain prepared to repeat its success in the 1971 war in any future conflict.

III. CURRENT AND PROJECTED INDIAN SURFACE FORCE COMPOSITION

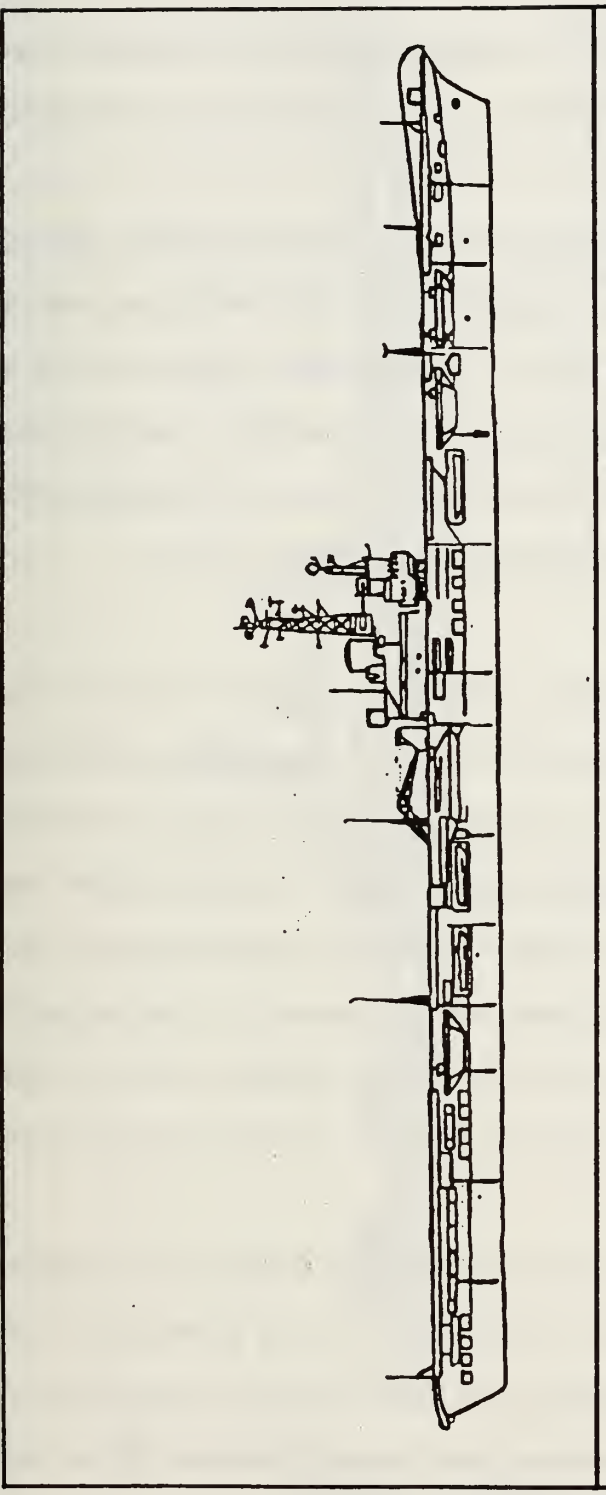
A. AIRCRAFT CARRIERS

The Indian aircraft carriers and their associated aviation assets constitute the primary offensive capability of the Indian surface fleet. The two carriers currently in the Indian inventory are limited by U.S. standards, yet represent the only regional carrier force in the Indian Ocean littoral region. Future developments of this carrier force will have significant impact on the strategic balance in the region.

1. *Majestic* Class

The British-built *Majestic* class carrier INS *Vikrant* (ex-HMS *Hercules*) (see Figure 2) was the first carrier acquired by the Indian Navy. The *Vikrant* has seen service continuously since 1961 and will probably reach the end of its service life toward the end of the decade.

The *Vikrant* has undergone several refits and modernization programs designed to retain credible combat capability until a replacement is obtained. The *Vikrant* had major overhauls in 1979, 1983, and 1987-1989. The last overhaul was intended to increase service life to 1997. During this overhaul, the *Vikrant*'s steam catapults were removed and a 10-degree ski ramp was installed to allow short takeoff rolls for the *Sea Harriers* (vice a high fuel consumption vertical launch) (Sharpe, 1990, p. 265). The basic tactical



NAME: *Vikrant* (R 21)
BUILDERS: Vickers–Armstrong Ltd.
COMMISSIONED IN INDIAN NAVY: 1961
PROPULSION: 4 boilers; 2 shafts
SPEED: 24.5 knots
RANGE: 12,000 nm at 14 knots;
6200 nm at 23 knots
ARMAMENT: 7–40 mm; additional 30 mm ADMGs
AIRCRAFT: 6 *Sea Harriers* FRS Mk 51
(capacity for 22)
9 *Sea King* Mk 42 ASW/ASUW
COMBAT DATA SYSTEMS: Selenia IPN- 10 added in 1985
DISPLACEMENT: 19,500 tons
RADARS: 1 D-band air Search
1 E/F-band air/surface search
1 I-band navigation
SONARS: 1 hull-mounted active

Figure 2. *Majestic* class Aircraft Carrier
(Source: Sharpe, 1990, p. 265)

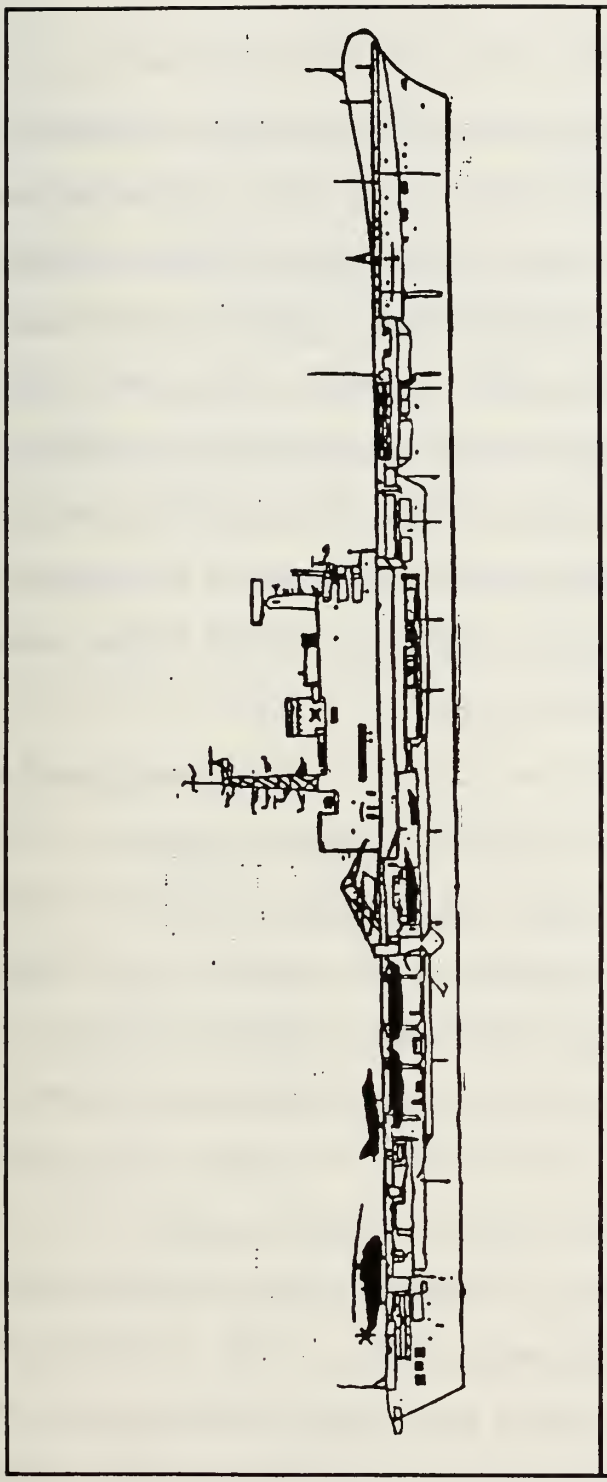
data system is of Italian design and is essentially a threat evaluation and management tool rather than a true NTDS system such as those used by the U.S. Navy. (Rackham, 1990, p. 26)

The *Vikrant*, despite these improvements, is rapidly moving towards obsolescence. Reduced operational tempo and additional refits may extend service life yet again, but the *Vikrant* is most likely past the point of diminishing returns for additional large-scale investments. This ship may have continued use after removal from front-line service as an assault carrier using *Sea King Mk42C* transport helicopters (Prezelin, 1990, p. 235).

2. *Hermes* class

The British *Hermes* class carrier *INS Viraat* (ex-*HMS Hermes*) (see Figure 3) was obtained from Britain in 1987 following an intensive refit and overhaul. During this refit period, the *Viraat* received new fire control equipment, navigation radars, and deck landing aids. The ship's boilers were converted to utilize distillate fuel and NBC capabilities were improved. The British *Seacat* missile system was removed, to be replaced at a future date by another SAM system (probably of Soviet origin). (Sharpe, 1990, p. 264) Additionally, the *Vikrant* has a transport capability of 750 troops and four LCVPs.

The *Viraat* is the pride of the Indian fleet and serves as the flagship. The *Viraat* has significantly better construction and is potentially more survivable than *Vikrant*. The flight deck is reinforced and the magazines and machinery spaces are protected by 1-2 inches of armor (Sharpe, 1990, p. 264). The *Viraat*, combat-tested during the Falklands War, will likely remain in service with the Indian Navy well into the next century.



NAME: *Viraat* (R 22)
BUILDERS: Vickers Shipbuilding
COMMISSIONED IN INDIAN NAVY: 1987
PROPULSION: 4 boilers; 2 shafts
SPEED: 28 knots
RANGE: Similar to *Vikrant*
ARMAMENT: 30 mm ADMGs;
future SAM system
SONARS: 1 hull-mounted active
AIRCRAFT: 12 *Sea Harriers* FRS Mk 51
(capacity for 30)
7 *Sea King* Mk 42B/C
ASW/ASUW/VERTREP
COMBAT DATA SYSTEMS: Selenia IPN-10
added in 1985
DISPLACEMENT: 28,700 tons
RADARS: 1 D-band air Search
1 E/F-band air/surface
search
1 I-band navigation

Figure 3. *Hermes* class Aircraft Carrier
(Source: Sharpe, 1990, p. 264)

3. Future Developments

There are no naval warships, with the possible exception of battleships, that inspire the same awe and sense of power that an aircraft carrier does. Although small by Western standards, the Indian aircraft carriers represent the pride and most potent striking capability of the Indian Navy. The future development of the Navy will likely continue to center about some type of aircraft carrier. Some Indian naval writers have called for a force of five carriers for the Indian Navy. (Roy, 1990, p. 73) Whether this desire will ever become a reality remains to be seen, however it is apparent that additional carriers are definitely in the plans of the Indian naval leadership.

India's next aircraft carrier is scheduled to be built in the shipyard at Cochin. Construction of this ship is scheduled to begin by the end of 1991 with commissioning planned for 1997. The French General Armaments Delegation's Naval Construction Directorate (DCN) conducted the design study for this carrier and the resulting proposal was selected over British and Soviet offers. The new carrier, reported to be of 30-35,000 tons displacement, will be of similar design to the French *Charles de Gaulle* class carrier, although not nuclear powered. The carrier is expected to operate up to 40 aircraft (CTOL or V/STOL) and will be a significantly more capable platform than the current Indian carriers (Mukherjee, 1989, p. 1124). Although the choice of conventional or V/STOL aircraft for the new carrier has yet to be publicly articulated (both types were considered in the design studies), Indian naval observers have stated that the naval leadership appears to believe that conventional carriers are what is needed for India's future naval

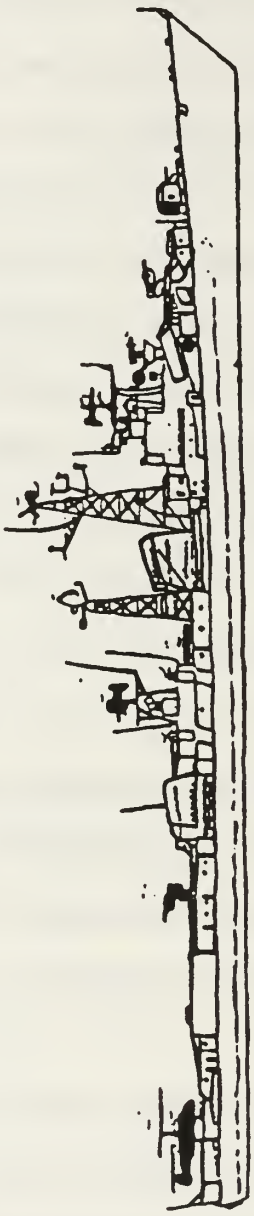
requirements (Tellis, Part II 1990, p. 37). The final choice of carrier type may depend to a large degree on the availability of carrier aircraft. Indian naval sources have stated that a conventional carrier would be preferred if the Indian Light Combat Aircraft (LCA) or French *Rafale* aircraft were available. If not, then a V/STOL configuration to best utilize the *Sea Harriers* would be the likely choice (Prakash, 1990, p. 68). Regardless of what type of carrier ultimately enters service with the Indian Navy, it is clear from the expressed views of the naval leadership that a naval aviation capability is a critical component of the Indian force structure. As one naval writer summarized, "air power at sea is the single most important factor in shaping fleet tactics and in the conduct of maritime operations." (Samaddar, 1991, p. 2)

B. DESTROYERS

1. Kashin II Class

The five Soviet *Kashin II* class destroyers (see Figure 4) currently in the Indian inventory are the most capable surface combatants in the fleet. Acquired during the 1980s, these vessels gave the Indian Navy a force of modern combatants more suited for offensive operations than the older frigates in the fleet.

This class was built as new construction for India in the Soviet Union and have several modifications, including a helicopter hangar in place of the aft 76 mm mount and SS-N-2C launchers that are located in front of the superstructure, facing forward, rather than facing aft as in the Soviet design. The five *Kashin II* destroyers possess the widest array of weaponry of any Indian warships and with the SA-N-1 SAM system (17 nm range), provide



NAME:	*Rajput*	(D 51)
	Rana	(D 52)
	Ranjit	(D 53)
	Ranvir	(D 54)
	Ranvijay	(D 55)
BUILDERS: Kommuna, USSR		
COMMISSIONED: 1980-1988		
PROPULSION: 4 gas turbines; 2 shafts		
ARMAMENT:	4	SS-N-C STYX ASM
	2	SA-N-1 GOA
	2	76 mm guns
	8	30 mm ADMG
	5	21 in. torpedoes
	2	RBU 6000 ASW mortars
AIRCRAFT:	1	KA-25 OR KA-2B ASW
DISPLACEMENT: 4950 tons		
RADARS:	1	C-band Air Search
	1	E-band 3D Air/Surface Search
	2	I-band Navigation
	2	H/I-band Fire Control
	1	G-band Fire Control
SONARS:	1 hull-mounted, 1 VDS	
SPEED: 35 knots		
RANGE:	4500 nm at 18 knots; 900 nm at 35 knots	

Figure 4. *Kashin II* class Destroyer
(Source: Sharpe, 1990, p. 264)

the Indian Navy with the only significant AAW protection currently in the fleet. These vessels are the nucleus of the escort force and will remain in service for the foreseeable future. (Sharpe, 1990, p. 265)

2. Future Developments

One of India's most ambitious indigenous ship construction projects is currently in progress to expand and improve the destroyer force. This program, designated *Project 15*, is intended to furnish the Indian Navy's principal surface combatant for the next 20 years (Tellis, Part II 1990, p. 39). *Project 15* (Table III) represents many firsts for India. These will be the largest warships designed and constructed in India (albeit with Soviet assistance) and will be the first indigenously designed ships to be powered by gas turbine engines.

Foreign technology will still be important as the gas turbines will be of Soviet design in the first unit and will be license-built U.S. LM2500 engines in the follow-on units. The first *Project 15* destroyer (*INS Delhi*) is scheduled for commissioning in early 1995. (Todd, 1991, p. 234)

TABLE III. *PROJECT 15* DESTROYER

(Sources: Sharpe, 1991, p. 264, and Todd, 1991, p. 234)

NAME: *Delhi* (2 additional on order)
BUILDERS: Mazagon Dock, Bombay
COMMISSIONED: Planned 1995
PROPULSION: CODAG: 2 gas turbines and 2 MTU diesels
ARMAMENT: 2 76 mm guns
4 SS-N-22 SSM
2 SA-N-7 or Trishul SAM
AIRCRAFT: 2 *Sea King* Mk 42B
DISPLACEMENT: 6500 tons
RADARS: Indra Air Search
Additional others
SONARS: Indian-developed VDS or towed array;
Bharat Apsoh hull-mounted
SPEED: Unknown
RANGE: Unknown

C. FRIGATES

Frigates constitute the bulk of the Indian surface combatant force and range from old steam-powered vessels to modern gas-turbine warships. New construction programs are in progress to modernize and improve this component of the surface combatant force.

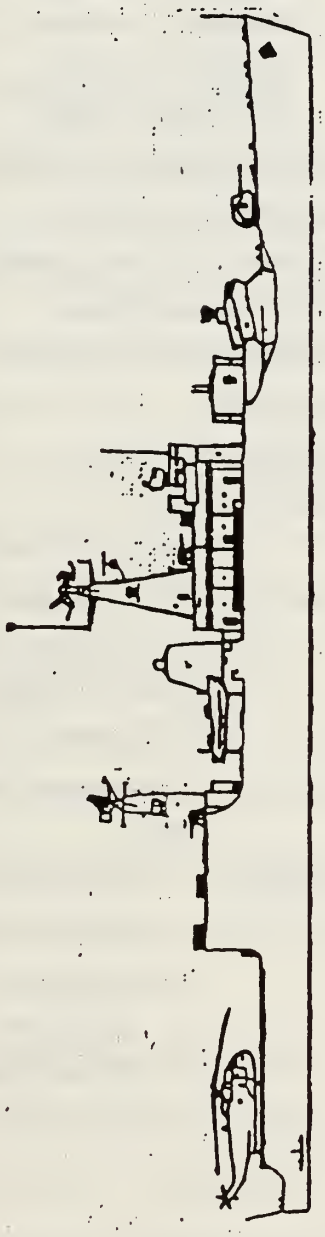
1. *Godavari* Class

The three *Godavari* class frigates (Figure 5) were the result of one of the first major indigenous warship construction programs attempted by India. The *Godavari* class is based on a modified *Leander* design and has an indigenous composition of 72%.

The *Gomati* was the first Indian ship to have digital electronics included in the combat data system. Although able to accommodate two helicopters, for stability reasons only one is usually embarked along with several crews (Prezelin, 1990, p. 238). The *Godavari* class was a major first step for India's indigenous production capability. These vessels do have some drawbacks, however. The mix of Soviet, Western, and Indian weapons systems have resulted in some equipment compatibility problems. Additionally, poor welding has been observed on *Godavari*. These and other problems are the likely reason that plans for an additional three vessels in the class have been discarded and an improved version (*Project 16*A) is being developed. (Sharpe, 1990, p. 266)

2. British *Leander* class

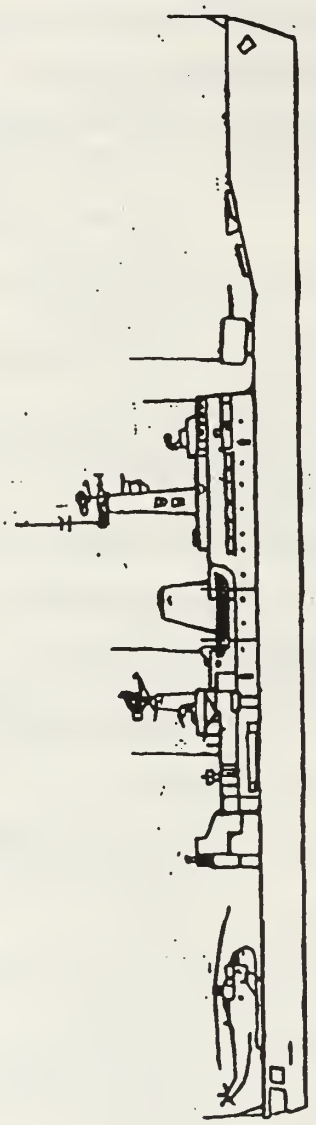
The six *Leander* class frigates (Figure 6) are the primary ASW ships of the Indian Navy. These vessels, with a 60% indigenous component were the first major warships to be constructed in Indian shipyards.



NAME: *Godavari* (F 20)
Gomati (F 21)
Ganga (F22)
BUILDERS: Mazagon Dock, Bombay
COMMISSIONED: 1983-1988
PROPULSION: 4 boilers, 2 shafts
ARMAMENT: 4 SS-N-2C STYX SSM
1 SA-N-4 SAM
2 57 mm guns
8 30 mm guns
6 ILAS 3 torpedoes
RANGE: 4500 nm at 12 knots
DATA SYSTEM: Selenia IPN-10
SPEED: 27 knots
AIRCRAFT: 2 *Sea King* or
1 *Sea King* and 1 *Chetak*
DISPLACEMENT: 4000 tons
RADARS: 1 D-band Air Search
1 E-band 3D Air/Surface Search
1 I-band navigation
2 H/I-band Fire Control (30 mm)
1 FH/I-band Fire Control (SA-N-4)
1 G/H-band Fire Control (57 mm)

SONARS: 1 Hull-mounted
1 VDS

Figure 5. *Godavari* Class Frigate
(Source: Sharpe, 1991, p. 266)



NAME:	*Nilgiri*	(F 33)
	Himgiri	(F 34)
	Udaygiri	(F 35)
	Dunagiri	(F 36)
	Taragiri	(F 41)
	Vindhyagiri	(F 42)
BUILDERS:	Mazagon Dock, Bombay	
COMMISSIONED:	1972-81	
PROPULSION:	2 boilers, 2 shafts	
RANGE:	4500 nm at 12 knots	
DATA SYSTEM:	Selenia IPN-10	
SPEED:	27 knots	
DISPLACEMENT:	2962 tons	
AIRCRAFT:	1 *Chetak* or	
	1 *Sea King* (F41 and F42)	
RADARS:	1 D-band Air Search	
	1 I-band Surface Search	
	2 I-band Navigation	
	2 I/I-band Fire Control	
SONARS:	1 Hull-mounted active	
	1 VDS	
ARMAMENT:	4 SS-N-2B STYX SSM	
	2 SEACAT SAM	
	2 4.5 in guns	
	2 20 mm guns	
	6 324 mm torpedoes	
	1 ASW mortar	

Figure 6. *Leander* Class Frigate
(Source: Sharpe, 1990, p. 267)

As the *Leander* class undergo refits, the SSM and sonar capabilities are being upgraded and modernized (Sharpe, 1991, p. 267). These vessels will continue in service until past the end of the decade.

3. Soviet *Petya-II* Class

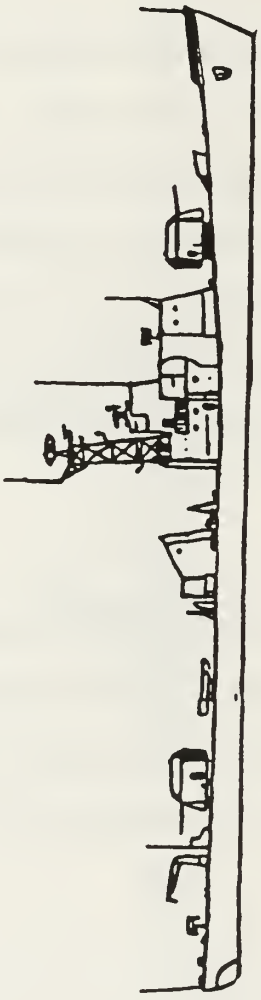
The six remaining *Petya II* class frigates (*INS Andaman* sank in 1990) were the first Soviet ships acquired by the Indian Navy. Although a substantial improvement in capability at the time, the *Petya II* class (Figure 7) are at the end of their service lives and are planned for decommissioning in the next two years. The limited offensive capabilities of these ASW vessels make their survival unlikely in a modern war at sea (Sharpe, 1991, p. 267). The likely role for these vessels during their remaining time in service will be that of coastal defense (Sojka, 1983, p. 7).

4. British *Whitby* Class

The two *Whitby* class ASW frigates (Figure 8) are the oldest frigates in the Indian fleet. These vessels were modernized in 1982-1983 and a helicopter hangar and deck were added. The age and marginal offensive capabilities of this class, however, should result in their decommissioning by 1995-1996. (Sharpe, 1990, p. 268)

5. British *Leopard* Class

The one vessel of the *Leopard* class (Figure 9) is also nearing the end of its useful life. With limited AAW and ASW capability, the major role this vessel could play would be that of an NGFS platform. The two 4.5-inch dual-purpose guns could provide credible gunfire support. This vessel is utilized normally as a cadet training vessel and will be replaced in the near future. (Sharpe, 1991, p. 268)



NAME: *Arnala* (F 68)
Androth (F 69)
Adjadip (F 73)
Amini (F 75)
Kamorta (F 77)
Kadmath (F 76)

BUILDERS: Khabaroysk

COMMISSIONED: 1969-73

PROPULSION: 2 gas turbines/1 diesel/3 shafts

RANGE: 4000 nm at 12 knots

DATA SYSTEM: Selenia IPN-10

RADARS: 1 F-band surface search
1 I-band navigation
1 I-band fire control

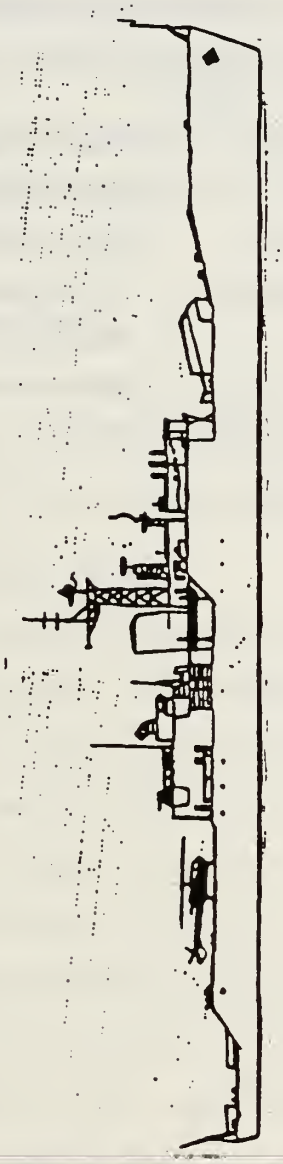
SONARS: 1 Hull-mounted active

ARMAMENT: 4 76 mm guns
3 533 mm torpedoes
4 RBV 2500 ASW mortars
2 Depth charge racks

SPEED: 32 knots

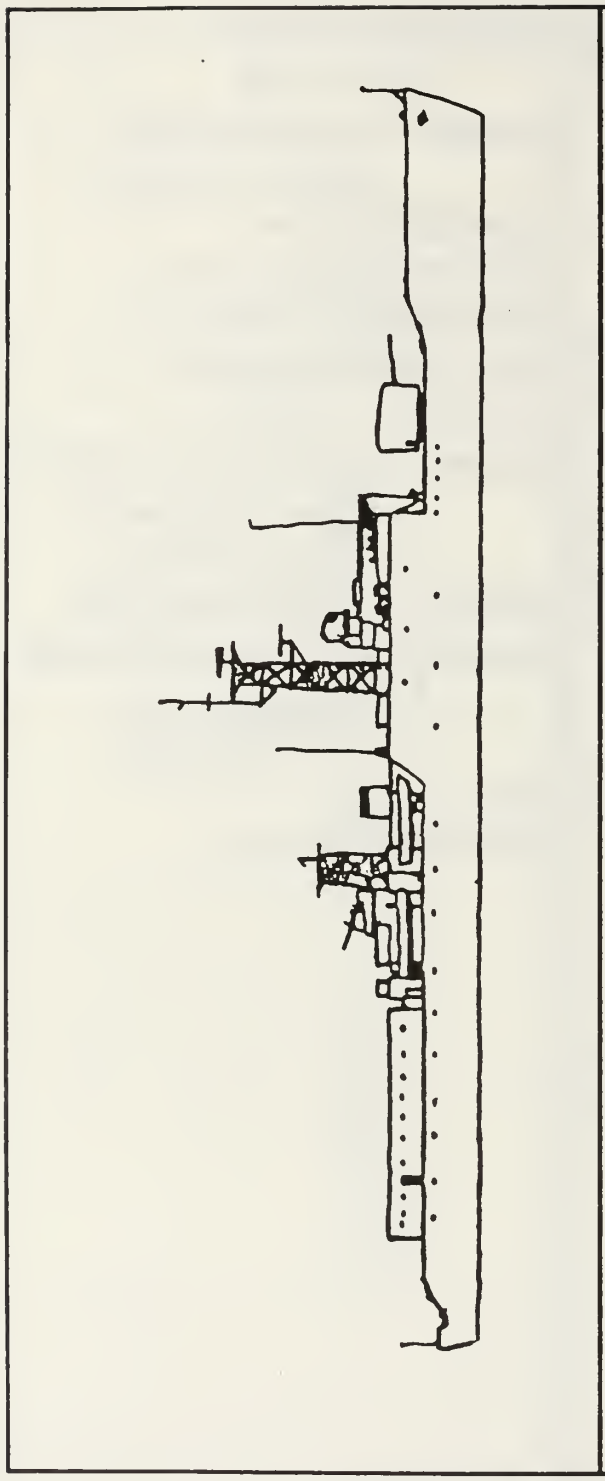
DISPLACEMENT: 1100 tons

Figure 7. *Petya II* Class Frigate
(Source: Sharpe, 1991, p. 265)



NAME: *Talwar* (F 40)
Trishul (F 43)
BUILDERS: Cammell Laird (F40)
Harland & Wolff (F43)
COMMISSIONED: 1960
PROPULSION: 2 boilers/2 shafts
RANGE: 4500 nm at 12 knots
DATA SYSTEM: Selenia IPN-10
AIRCRAFT: 1 *Chetak*
RADARS: 1 E/F-band Air/surface search
1 I-band surface search
1 I-band navigation
SONARS: 1 Hull-mounted active
ARMAMENT: 4 SS-N-2A STYX SSM
4 30 mm guns
1 ASW mortar
SPEED: 30 knots
DISPLACEMENT: 2550 tons

Figure 8. *Whitby* Class Frigate
(Source: Sharpe, 1991, p. 265)



NAME: *Beas* (F 37)
BUILDERS: Vickers-Armstrong
COMMISSIONED: 1960
PROPULSION: 8 diesels/2 shafts
RANGE: 6000 nm at 15 knots
SPEED: 24 knots
RADARS: 1 E/F-band surface search
1 I-band navigation
SONARS: 1 Hull-mounted active
ARMAMENT: 2 4.5-inch guns
2 40 mm guns
1 ASW mortar
DISPLACEMENT: 2555 tons

Figure 9. *Leopard* Class Frigate
(Source: Sharpe, 1991, p. 266)

6. Future Developments

The future additions to the frigate force will consist of the *Project 16A* vessels currently under construction. Little is available in the open press about *Project 16A* except that it is an improved version of the *Godavari* class and that the first one is planned to be in service in 1994 (Sharpe, 1990, p. 266). Three of these vessels are currently under construction in Calcutta (Preston, 1991, p. 45)

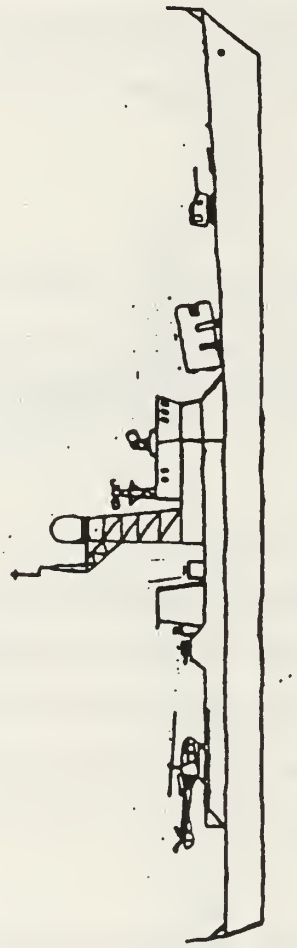
D. CORVETTES

The corvette forces of the Indian surface fleet are rapidly increasing in quantity and quality. Soviet as well as Indian programs are in full swing and will result in an enhanced offensive capability for the Indian Navy.

1. *Khukri* Class

The *Khukri* class corvettes (Figure 10) are being constructed to replace the aging *Petya II* class frigates. These ships are being designed and built in India with a total of eight planned. The *Khukri* class is intended to be used for extended maritime patrol and have excellent endurance (4000 nm) for a small combatant. Construction of this class is primarily steel (indigenously produced) (Mama, 1989, p. 1685). The total indigenous content of this class is approximately 65% (Sharpe, 1991, p. 269).

The first *Khukri* class corvettes are oriented towards ASW. The second group of four will be oriented towards AAW with the addition of an Indian air search radar and the SA-N-4 SAM system (Sharpe, 1990, p. 269). This class will eventually be equipped with the Indian Advanced Light Helicopter (ALH). This aircraft will have an ASUW capability as well as torpedoes, depth charges and a dipping sonar for ASW. An upgraded follow-on class to the *Khukri* class is currently being planned (Mama, 1989, p. 1685).



NAME: *Khukri* (P 49)
Kuthar (P 50)
Kirpan (P 51)
Khanjar (P 52)—fitting out
BUILDERS: Mazagon Docks and Garden Reach
COMMISSIONED: 1989 (P 49)
1990 (P 50)
1991 (P 51)
1991 (P 52)
PROPULSION: 2 diesels/2 shafts
RANGE: 4000 nm at 18 knots
SPEED: 25 knots
RADARS: 1 E-band air search
1 I-band air/surface search
1 H/I-band fire control
1 I-band navigation
SONARS: 1 Hull-mounted active
ARMAMENT: 4 SS-N-2C STYX
1 SA-N-5 SAM
1 76 mm gun
2 30 mm ADMG
6 324 mm torpedoes
DISPLACEMENT: 1350 tons
AIRCRAFT: 1 *Chetak* (to be replaced by ALH)

Figure 10. *Khukri* Class Corvette
(Source: Sharpe, 1990, p. 269)

2. Soviet *Pauk II* class

The two *Pauk II* class corvettes (Table IV) are recent additions to the surface force, imported from the Soviet Union in 1989 and 1990. These vessels appear to be oriented towards ASW and maritime interdiction as evidenced by a lack of ASM capability and the addition of a VDS housing on the stern. A minimum of five of this class is planned.

TABLE IV. *PAUK II* CLASS CORVETTE

(Source: Sharpe, 1991, p. 267)

NAME: *Abhay* (P 33)
Ajay (P 34)
Akshay (P 35)
Agray (P 36)

BUILDERS: USSR

COMMISSIONED: 1989-1990

PROPULSION: 2 diesels/2 shafts

RANGE: 2000 nm at 20 knots

SPEED: 32 knots

RADARS: 1 E/F-band air/surface search
1 H/I-band fire control
1 I-band navigation

SONARS: 1 VDS

ARMAMENT: 1 SA-N-5 SAM
1 76 mm gun
1 30 mm gun
4 533 mm torpedoes
2 RBU 1200 ASW mortars

DISPLACEMENT: 520 tons

3. *Tarantul I* Class

The six *Tarantul I* class corvettes (Table V) were obtained from the Soviet Union from 1987–1991. Additional units of this class are being built in Indian shipyards. Currently 12 additional units are under construction or on order (Preston, 1990, p. 46-50). The total number planned for this class could total 24 vessels. (Sharpe, 1990, p. 268) The *Tarantul I* class are dedicated ASUW platforms and add significant strike capability to the Indian surface fleet.

4. Soviet *Nanuchka II* Class

The three *Nanuchka II* class corvettes (Table VI) were acquired from the Soviet Union from 1976 to 1978. These vessels are also dedicated ASUW

platforms with little AAW and no ASW capability. (Sharpe, 1990, p. 269) No additional units are scheduled to be purchased, probably as the result of their poor seakeeping performance. (Prezelin, 1990, p. 240)

TABLE V. *TARANTUL I* CLASS CORVETTE

(Source: Sharpe, 1991, p. 266)

NAME: *Veer* (K 40)
Nirbhik (K 41)
Nidat (K 42)
Nishank (K 43)
Nirghal (K 44)
Unnamed (K 45)
BUILDERS: USSR
COMMISSIONED: 1987-1991
PROPULSION: 4 gas turbines/2 shafts
RANGE: 2000 nm at 20 knots; 400 nm at 36 kts
SPEED: 36 knots

RADARS: 1 E-band air/surface search
1 I-band navigation
1 H/I-band fire control
SONARS: None
ARMAMENT: 4 SS-N-2C STYX
1 SA-N-5 SAM
1 76 mm gun
2 30 mm ADMG
DISPLACEMENT: 580 tons
AIRCRAFT: None

TABLE VI. *NANUCHKA II* CLASS CORVETTE

(Source: Sharpe, 1990, p. 267)

NAME: *Vijay Durg* (K 71)
Sindho Durg (K 72)
Hos Durg (K 73)
BUILDERS: Petrovskiy USSR
COMMISSIONED: 1976-1978
PROPULSION: 3 diesels/3 shafts
RANGE: 2500 nm at 12 knots; 900 nm at 31 kts
SPEED: 34 knots
AIRCRAFT: None

RADARS: 1 I-band air/surface search
1 F/H/I-band fire control
1 G/H-band fire control
1 I-band navigation
SONARS: None
ARMAMENT: 4 SS-N-2B STYX
1 SA-N-4 SAM
2 57 mm gun
DISPLACEMENT: 660 tons

5. Future Development

The future plans for the Indian corvette program consist of continual indigenous production of the *Khukri* and *Tarantul I* class vessels. The addition of *Tarantul I* units will greatly enhance the Indian Navy's ASUW capabilities while the *Khukri* class will provide additional ASW assets (with improved AAW capabilities) to the fleet. The Indian Navy has recently

purchased three South Korean *Neptune* class patrol ships (with four additional on order). These ships are lightly armed (twenty 40 mm guns) but can be fitted with additional AAW and ASUW weapons, as are the South Korean Navy's versions of this class (Sharpe, 1990, p. 270). If this upgrade is done at a later date, these ships will add considerably to the Indian Navy's maritime interdiction capability.

E. AMPHIBIOUS FORCES

The amphibious forces of the Indian surface fleet have grown steadily since the 1970s. Although still only a minor power projection asset, the continuing new construction and the Indian desire to defend its island territories indicate that amphibious forces will continue to have a role in Indian naval strategy.

1. Soviet *Polnochny* Class LSMs

The eight *Polnochny* class LSMs (Table VII) were acquired from Poland during the period 1975 to 1986. Each of this class can carry 350 tons of equipment and 140 troops. The last four are *Polnochny D* class and have a helicopter platform and different radars than the earlier C class. It is reported that an additional two units of this class may be ordered (Sharpe, 1990, p. 271).

2. *Magar* Class LST

The *Magar* class LST (Table VIII) is the largest ship currently built in India. Based on the British *Sir Lancelot* class, the *Magar* class has substantial troop and tank transport capability. A second unit is under construction in Calcutta and a total of eight ships of this class is planned. (Sharpe, 1990, p. 271)

TABLE VII. *POLNOCHNY* CLASS LSM

(Source: Sharpe, 1990, p. 271)

NAME: *Ghorpad* (L 14)
Kesari (L 15)
Shardul (L 16)
Sharabh (L 17)
Cheetah (L 18)
Mahish (L 19)
Guldar (L 21)
Kumbhir (L 22)

BUILDERS: Poland
PROPULSION: 5 diesels/3 shafts
RANGE: 2000 nm at 12 knots

RADARS: 1 I-band navigation
1 H/I-band fire control (*D* variant only)
ARMAMENT: 4 30 mm guns
2 140 mm rocket launchers
DISPLACEMENT: 1150 tons
LIFT: 350 tons; 140 troops
SPEED: 18 knots
AIRCRAFT: Helo platform (*D* variant only)

TABLE VIII. *MAGAR* CLASS LST

(Source: Sharpe, 1991, p. 270)

NAME: *Magar* (L 20)
Gharial (L 23) (under construction)
BUILDERS: Garden Reach, Calcutta
PROPULSION: 2 diesels/2 shafts
RANGE: 8000 nm at 15 knots
SPEED: 15 knots

RADARS: 1 navigation
ARMAMENT: 4 40 mm guns
2 rocket launchers
DISPLACEMENT: 5655 tons
LIFT: 340 tons
AIRCRAFT: 1 *Sea King* 42C

3. *Vasco da Gama* Class LCU

The seven *Vasco da Gama* class LCUs (Table IX) are the smallest Indian amphibious vessels. These ships were built in India from 1978 to 1987. This class has a relatively short range of 1000 nautical miles and can carry 250 tons of equipment and 125 troops.

4. Future Development

The Indian amphibious forces will continue to expand with the completion of additional *Magar* class LSTs and *Polnochny* class LSMs. Furthermore, a larger dock landing ship (LSD) is reportedly in the initial design and planning stages (Prezelin, 1990, p. 242). The addition of these

vessels will continue to improve India's burgeoning power projection capabilities.

TABLE IX. *VASCO DA GAMA* CLASS LCU

(Source: Sharpe, 1990, p. 271)

NAME: *Vasco da Gama* (L 34)
Unnamed (L 35–37)
Midhur (L 38)
Mangala (L 39)
Unnamed (L 40)

BUILDERS: Goa Shipyard
COMMISSIONED: 1980-1987
PROPULSION: 3 diesels/3 shafts
RANGE: 1000 nm at 8 knots
SPEED: 9 knots

RADARS: None
ARMAMENT: 2 40 mm guns
DISPLACEMENT: 500 tons
LIFT: 250 tons/125 troops
AIRCRAFT: None

F. LOGISTIC FORCES

The logistic forces of the Indian surface fleet have apparently received the lowest funding priorities throughout the Indian Navy's existence. Although current plans include additional replenishment capability, this aspect of the Indian fleet will need to be greatly improved in order to support any credible sustained power projection capability.

1. *Deepak* Class Oiler

The two German *Deepak* class oilers (Table X) provide the Indian Navy's only "combat logistics" capability. These vessels were chartered by the Navy from a civilian firm that had paid for their construction (Sharpe, 1990, p. 273). This class also is helicopter-capable and has a telescoping hangar and flight deck. The *Deepak* class utilizes British-style replenishment rigs and carries fuel oil, diesel fuel, aviation fuel, fresh water and dry cargo and are capable of astern and alongside refueling. (Prezelin, 1990, p. 243) The design

of these ships is being used as the basis for a new class of AOR currently under construction.

TABLE X. *DEEPAK* CLASS OILER

(Source: Sharpe, 1991, p. 272)

NAME: *Deepak* (A 50)
Shakti (A 57)
BUILDERS: Bremer-Vulkan
COMMISSIONED: 1972 (A 50)
1976 (A 57)
PROPULSION: 1 boiler/1 shaft
RANGE: 5500 nm at 16 knots
SPEED: 18.5 knots

RADARS: 1 I-band navigation
ARMAMENT: 4 40 mm guns
2 20 mm guns
DISPLACEMENT: 15,828 tons
CARGO: 1280 tons diesel fuel
12,624 tons fuel oil
1495 tons aviation fuel
812 tons fresh water
AIRCRAFT: 1 *Chetak*

2. *Poshak* Class Support Tankers

The two Poshak class support tankers (Table XI), completed in 1982 and 1988, possess a significantly smaller cargo capability than the *Deepak* class and have no real capability for underway replenishment. The primary use for these vessels is inport replenishment of surface vessels, and they could serve to facilitate quicker "turnaround" times for surface combatants during extended periods of operations.

TABLE XI. *POSHAK* CLASS SUPPORT TANKER

(Source: Sharpe, 1990, p. 273)

NAME: *Poshak*
Puran
BUILDERS: Mazagon Dock
PROPULSION: 1 diesel/1 shaft
RANGE: minimal

RADARS: None
ARMAMENT: None
DISPLACEMENT: 15,828 tons
CARGO: 200 tons
SPEED: 9 knots

3. *Pradhyak* Class Support Tankers

The two *Pradhyak* class support tankers (Table XII) are similar in capability to the *Poshak* class and were completed in 1977 and 1978. These

vessels have no underway replenishment capability and, like the *Poshak* class, are utilized for inport refueling.

TABLE XII. *PRADHYAK* CLASS SUPPORT TANKER

(Source: Sharpe, 1990, p. 273)

NAME: *Pradhyak*
Purak
BUILDERS: Rajabagan Yard, Calcutta
PROPULSION: 1 diesel/1 shaft
RANGE: minimal
RADARS: None
ARMAMENT: None
DISPLACEMENT: 960 tons
CARGO: 376 tons fuel oil
SPEED: 9 knots

4. Future Developments

The two *Deepak* class oilers are the Indian navy's only combat logistics ships and would be hard pressed to support extended fleet operations. In apparent recognition of this logistic weakness, a new replenishment and repair ship (similar to U.S. AOR) is under construction. The *Rajaba Gan Palan* class (Table XIII) is of German design and is similar to the *Deepak* class but longer and has additional machinery repair shops. This class is being built in Calcutta and will provide Indian shipbuilders with valuable experience in logistic vessel construction. Currently two vessels of this class are planned (Sharpe, 1990, p. 273). The addition of these logistic units to the fleet will greatly enhance the flexibility and sustainability of the Indian surface fleet.

G. SUMMARY

The Indian surface force has improved steadily in terms of numbers and capability over the past two decades. As indicated in Table XIV, the number of vessels has grown in all primary warfare areas with the exception of AAW. Of interest is the improvement in the ASUW, logistics and amphibious

warfare areas—categories traditionally associated with power projection. The capability of the Indian surface force in these areas will continue to improve. The major weakness has been and will continue to be a lack of effective organic AAW capability. With that exception, the Indian surface fleet will continue to develop its power projection and support capabilities over the next few years.

TABLE XIII. *RAJABA GAN PALAN* CLASS AOR

(Source: Sharpe, 1991, p. 272)

NAME: *Rajaba Gan Palan*
BUILDERS: Garden Reach, Calcutta
PROPULSION: probably 2 diesels/1 shaft
RANGE: 10,000 nm at 16 knots
AIRCRAFT: 1 *Cheetak*
RADARS: Unknown
ARMAMENT: 3 40 mm guns
DISPLACEMENT: appx. 22,000 tons
CARGO: similar to *Deepak* class with additional ammunition capacity
SPEED: 20 knots

TABLE XIV. INDIAN SURFACE FORCE TRENDS: NUMBERS OF SHIPS IN PRIMARY WARFARE AREAS (1971-96)

YEAR	AAW	ASW	ASUW	Logistics	Amphibious
1971	3	11	15	4 (1 CLF)	6
1976	0	4	27	4 (1 CLF)	7
1981	0	6	27	6 (2 CLF)	11
1985	0	8	24	6 (2 CLF)	12
1991	0	15	28	6 (2 CLF)	16
1996 (projected)	0	24	39	6 (3 CLF)	20

IV. INDUSTRIAL SUPPORT FOR INDIAN SURFACE FORCE DEVELOPMENT

A naval force is hollow unless sufficient construction/maintenance, national industry, and research and development (R&D) assets are available to maintain that force at a high level of efficiency. Although lacking in several key areas, India has made major strides in these areas over the past few years and appears to be committed to improving and expanding the defense industrial base. (Locations of industrial facilities are provided in Figure 11.)

A. SHIPYARDS

India has four major shipyards that are engaged in warship construction. These are:

- Mazagon Docks Ltd. (MDL)
- Garden Reach Shipbuilders and Engineers (GRSE)
- Goa Shipyard
- Hindustan Shipyard

Although the majority of warships constructed in India have been license built to foreign designs, the Indian shipbuilding industry has steadily increased the indigenous content of its warships and has made great strides in the area of ship design as evidenced by the PROJECT 15 and *Khukri* class warships. The fleet support capabilities of these shipyards have also steadily improved during the past few years.

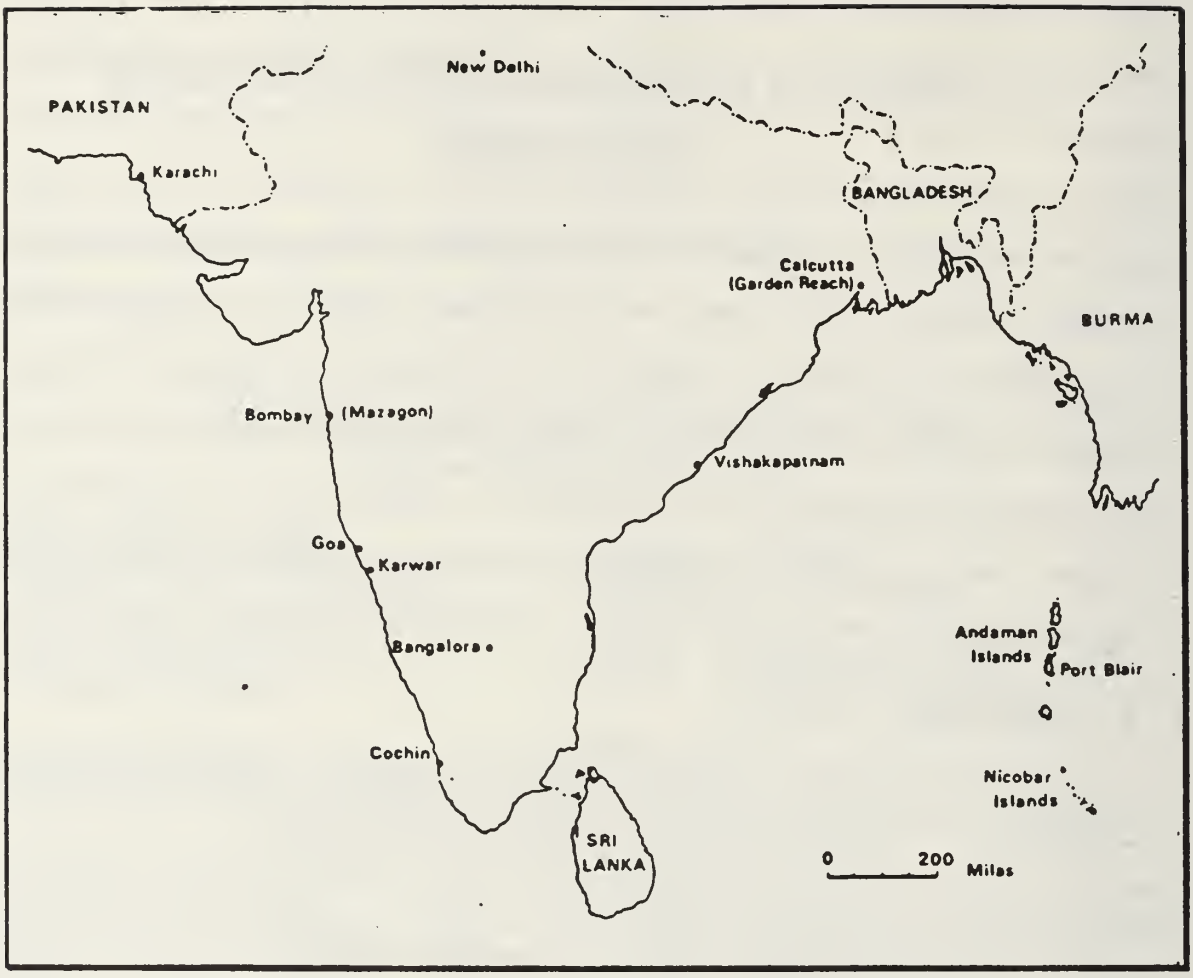


Figure 11. Major Indian Industrial and Port Locations
(Source: Grazebrook, 1987, p. 59)

1. **Mazagon Docks, Ltd.**

Mazagon Docks Limited (MDL) is India's principal producer of warships. MDL, located in Bombay, was a relatively minor shipyard until it was modernized and expanded in the 1960s to facilitate construction of the *Leander* class frigates (Singh, 1987, p. 6). Like all of the major shipyards in India, MDL is state-owned and operated. Additional modernization programs were implemented at MDL during the 1980s with the construction

of a carrier-capable drydock and the establishment of a heavy diesel engine repair shop. (Ministry of Defence, 1989, p. 11) MDL currently is involved in the following construction programs:

- 2 Project 15 destroyers under construction
- 4 *Tarantul I* class corvettes under construction
- 2 *Tarantul I* class corvettes on order
- 1 *Khukri* class corvette fitting out (Preston, 1991, p. 50)

The shipbuilding expertise of MDL, gained during construction of the *Leander, Godavari, Khukri* and *Tarantul I* classes, combined with current and future contracts will allow MDL to remain India's premier shipyard.

2. Garden Reach Shipbuilders & Engineers

The second major naval shipyard is Garden Reach Shipbuilders & Engineers (GRSE) located in Calcutta. For many years, GRSE was primarily a small combatant construction facility. In recent years, however, GRSE has significantly diversified construction projects to include amphibious and logistics vessels as well as auxiliary naval machinery. In 1988, GRSE signed a license agreement with West Germany to indigenously manufacture marine diesel engines and generators for naval vessels. That same year, GRSE converted a slipway into a warship construction berth (Government of India, 1989, p. 30). Current naval projects at GRSE include:

- Three Project 16A frigates on order
- Two *Khukri* class corvettes fitting out
- Four *Neptune* class patrol vessels on order
- One *Magar* class LST under construction
- One *Rajaba Gan Palan* replenishment ship under construction (Preston, 1991, p. 45)

The current and anticipated naval construction projects, combined with ongoing modernization, will allow GRSE to grow in importance as a source of warships for the Indian Navy.

3. Goa Shipyard Limited

Goa Shipyard Limited (GSL), located in Goa, is a subsidiary of MDL and is primarily involved in the construction of smaller ships for the Indian Navy. (Howarth, 1986, p. 443). GSL built several of the Indian Navy's LCUs, as well as oceanographic and minor auxiliaries (Prezelin, 1990, p. 244). Facilities at GSL were improved in the 1980s with the establishment of steel cutting and blasting facilities. (Government of India, 1989, p. 31) Current naval construction projects consist primarily of license production of 9 *Tarantul I* class frigates currently on order (Preston, 1991, p. 46). Due to its limited facilities, GSL will likely remain the smallest of India's naval shipbuilding companies.

4. Hindustan Shipyard

Hindustan Shipyard, located in Vishakhapatnam, is physically the largest shipyard in India (Sojka, 1983, p. 12). Despite its size, Hindustan Shipyard has concentrated primarily on the construction of smaller vessels for the Indian Navy while devoting most of its resources to commercial production. The main naval project now active is the license production of the *Neptune* class offshore patrol ships (Lenton, 1991, p. 186). Some press reports list Hindustan Shipyard as the site of the construction of India's next aircraft carrier, but most sources seem to indicate that the construction will be done at the naval shipyard at Cochin. For the foreseeable future, Hindustan

Shipyard will probably remain oriented towards small combatant construction.

B. BASES

After warships are provided to the fleet by the shipyards, maintenance and overhauls are usually accomplished at the Indian Navy's major bases. These facilities include bases located in:

- Bombay
- Vishakhapatnam
- Cochin
- Port Blair (Andaman Islands)

The naval base at Bombay, India's major naval facility, includes the headquarters of the Western Naval Command, berthing facilities and a large naval shipyard (Sharpe, 1990, p. 260). Bombay currently has two carrier berths and additional piers and a carrier-capable drydock are currently under construction. Maintenance facilities are extensive and are continually being upgraded (Government of India, 1989, p. 11). The naval shipyard has recently added improved diesel maintenance, rubber manufacturing and non-destructive testing facilities to allow for more efficient and responsive fleet maintenance support (Singh, 1990, p. 7).

The naval base at Vishakhapatnam houses the headquarters of the Eastern Naval Command, berthing facilities, and a major naval shipyard. The shipyard was extensively refurbished and modernized during the 1980s with extensive Soviet assistance (Sharpe, 1990, p. 260). Additional modernization plans include new drydock facilities, degaussing facility, and a marine gas turbine overhaul facility that will eliminate the need to send gas

turbines overseas for overhaul (Government of India, 1989, p. 11). Vishakhapatnam is also having berthing facilities expanded to accommodate aircraft carriers. (Nadkarni, 1991, p. 28)

The naval base at Cochin houses the headquarters of the Southern Naval Command and the majority of the Indian Navy's training establishments. A ship repair facility is located at Cochin and is being upgraded and improved (Sharpe, 1990, p. 260). Various press reports list Cochin as the probable construction site for India's indigenous carrier. With the addition of a Southern Fleet possible in the near future, Cochin would become a facility of increasing importance. (NOTE: Details of a possible formation of an additional fleet are provided in Chapter VI.)

The naval facility located at Port Blair in the Andaman Islands houses the Indian Navy-commanded joint organization responsible for the Andaman and Nicobar Islands (The command is called FORTAN-Fortress Andaman/Nicobar). Port Blair was originally a small patrol craft base but has grown over recent years to become a major naval facility in a key strategic position dominating the Malacca Straits. The base repair organization at Port Blair has been augmented to provide short overhauls for ships based there. Additionally, a floating drydock has been added and base facilities have been modernized (Government of India, 1989, p. 11). These enhancements have converted Port Blair into one of the Indian Navy's largest bases (Tellis, Part II 1990 p. 44).

The major base development currently in progress is the construction of a naval base at Karwar. This project (designated Project Sea Bird) will result in the development of Asia's largest naval facility (Tellis, Part II 1990, p. 43).

Berthing and dry dock facilities for aircraft carriers and surface combatants are planned and the initial phase of construction is due to be completed in 1996. (Sharpe, 1990, p. 260). A combined Australian/Dutch partnership participated in the planning and designing of the facility, which is estimated to cost approximately two billion dollars (1989 U.S.) over the next 25 years. (Hamilton, 1989, p. 14). The development of the base at Karwar will place Indian surface combatants closer to Arabian Sea and Indian Ocean operating areas and will significantly ease the current congestion at Bombay (Tellis, Part II 1990 p. 43). The base at Karwar is planned to be the new homeport of the Western Fleet upon completion, unless a third fleet is formed and based at Karwar (Singh, 1987, p. 19).

Additional naval facilities, albeit of a smaller scale, are available to the Indian Navy at Madras and Calcutta. Seven minor facilities are located in the Lakshadweep island chain (part of the Laccadive archipelago) and currently are the bases for patrol craft. Tentative plans call for extensive expansion and fortification of these facilities (Tellis, Part II 1990, p. 43).

The various naval bases of the Indian Navy are modern industrial facilities capable of providing quality support to the fleet. The geographic dispersion of these bases reduces their vulnerability to simultaneous attack and allows ease of access to operating areas for fleet units. The facilities are situated ideally adjacent to vital SLOCs. The establishment of first-class bases is a key factor behind the development and improved capabilities of the Indian surface fleet. (NOTE: a list of Indian naval bases is provided in Appendix C).

C. RESEARCH AND DEVELOPMENT

The Indian military establishment is supported by one of the most extensive defense research and development (R&D) organizations in the world. India's defense research budget has typically comprised two percent of the defense budget and eleven percent of the total government research allocations. A significant increase in R&D funding, however, was received in 1988-89 when 5.15% of the defense budget was allocated to R&D (Prakash, 1988, p. 28). The R&D structure consists of 46 major R&D organizations (facilities and laboratories) and are organized under the Defense Research and Development Organization (DRDO) (Howarth, 1986, p. 436). A list of these facilities is provided in Appendix E. The laboratories that are specifically dedicated to naval support are the following:

- Naval Physical & Oceanography Laboratory
- Naval Chemical & Metallurgical Laboratory
- Naval Science & Technological Laboratory

The Naval Physical & Oceanography Laboratory (NPOL), located in Cochin, has conducted extensive research in sonar technology development and is producing equipment that is reputed to be of similar quality as foreign designs. State-of-the-art hull-mounted and variable-depth sonars are either in production or under development. The Advanced Panoramic Sonar, Hull-Mounted (APSOH) system is installed in the *Godavari* and *Leander* classes and will be included in the Project 16A class warships. NPOL is also developing improved sonobuoy hardware and processing systems, as well as sonar simulations for improved training (Prakash, 1988, p. 27). As these

systems become operational, they will contribute significantly to improving the ASW capabilities of the Indian surface fleet.

There is not a great deal of information available concerning the projects of the Naval Chemical & Metallurgical Laboratory (NCML). NCML, located in Bombay, has worked jointly on many projects headed by other laboratories. The major thrust of recent research at NCML appears to be in the areas of corrosion control and anti-fouling (Prakash, 1988, p. 27). Continuing development in these areas could be indicative of a desire to operate warships for extended periods of time away from home waters.

The Naval Science & Technology Laboratory (NSTL), located in Vishakhapatnam, is involved extensively with the development of torpedoes. The lightweight homing torpedo, NST-58, has been deployed aboard the *Godavari* and *Leander class* frigates as a substitute for imported Italian torpedoes (Prakash, 1988, p. 27). The development of the NST-58 and its associated launch systems, along with the current development of additional active/passive ASW torpedoes, is another indication of the importance of ASW to the Indian Navy and a reflection of the desire of the Indian Navy to be less dependent on foreign sources for weapons procurement.

Although the facilities discussed above are dedicated to naval support, many other defense laboratories are engaged in naval R&D, especially in the development of electronics and radar. The development of EW systems and radars for the Indian Navy by Bharat Electric, of the Advanced Lightweight Helicopter (ALH) by Hindustan Aeronautics, Ltd and the production of chaff systems by the Explosive R&D Establishment are a few examples of the

diversity of R&D organizations involved in naval projects (Howarth, 1986, p. 440).

The growth in the defense R&D community will gradually be reflected in increased sophistication and capabilities of Indian military systems. A former defense official stated that India's ability to reduce its dependence on foreign sources is dependent upon "... the growth of domestic R&D and technology on the one side and industrial strength on the other ..." (Seshan, 1988, p. 18). This desire for increased self-reliance and capable weapons capabilities will likely result in a continued emphasis on defense R&D.

D. DEFENSE INDUSTRY

Extensive defense R&D efforts are of little value unless systems can be produced and delivered to users in a timely and efficient manner. India has a large defense infrastructure devoted to military systems production. Much of this industry was initially inherited from Great Britain and has been developed by India in the years since independence (Jones, 1986, p. 182). The Department of Defence Production & Supplies manages the Indian defense industry, which currently consists of 36 ordnance factories and eight Defense Public Sector Undertakings (essentially large state-controlled contractors) and employs approximately 285,000 scientists and engineers (Ragunthan, 1990, p. 29). Although many of these facilities handle projects for each of India's armed services, the facilities dedicated to or heavily involved in naval hull construction or ship systems are:

- Bharat Dynamics Ltd.
- Bharat Electronics Ltd.
- Garden Reach Shipbuilders and Engineers Ltd.

- Goa Shipyards Ltd.
- Mazagon Dock Ltd.

A list of defense production facilities is provided in Appendix F.

GRSE, GSL, and MDL have been discussed previously. An additional note is that these companies, besides ship construction, do extensive work in the manufacture of engineering equipment, turbines, pumps, and auxiliary machinery. Bharat Dynamics Ltd. and Bharat Electronics Ltd. (BEL), one of the largest defense companies in India, produce naval systems such as fuses, torpedo electronics, fire control equipment, radars, sonars and naval communications equipment.

The development of the defense R&D and production organizations have allowed India to make great strides toward defense self-reliance. India still depends to a large degree, however, on foreign sources for component technologies such as metal alloys and computer electronics (Vlahos, 1988, p. 11). Despite these weaknesses, India's potential for eventual defense autonomy appears good. The defense technicians and scientists, augmented with university and civilian public sector R&D staff, favor India with the third largest pool of technical personnel in the world (Clad, 1990, p. 47). This potential, combined with the stated goal of India's Secretary of Defense Production of "self-reliance, with particular reference to indigenization in the face of fast-changing technology ..." (Raghunathan, 1990, p. 30) could lead to virtual defense autonomy in most production areas by the end of the decade. One significant exception, however, is in the area of naval self-reliance.

Despite future promise, the present reality is that the Indian Navy is the most dependent of the armed forces on foreign suppliers (followed closely by

the Indian Air Force), especially for weapons stocks. The surface fleet is moving rapidly toward self-sufficiency in the areas of ship construction and naval system design. A glaring exception to this trend, however, is evidenced in surface ship weaponry.

During the 1980s, Soviet STYX SSMs, SA-N-1 and SA-N-5 SAMs and British Sea Skua SSMs were all imported by India as a result of no substantial development in indigenous systems (SIPRI, 1990, p. 278). The Soviet Union has been India's major naval weaponry supplier for many years. The Indian government purchased these systems from the Soviets with rupees which were then used by the Soviets to purchase Indian products such as agricultural items—essentially a barter system. In 1989, the Soviet Union indicated a desire for hard currency for naval weapons—a position likely to strengthen with increasing Soviet fiscal problems (Tellis, 11 September 1991). In order to maintain operational readiness, the Indian Navy, at least for the near-term, will probably continue to rely on Soviet imports. Given the current Soviet financial problems and need for currency, however, weapons transfer terms favorable to India will likely result. Although India also has domestic financial concerns, it is definitely in a stronger economic position relative to the Soviet Union and will have significant negotiating leverage. The Indian defense establishment provides strong support for the development, maintenance, and deployment of surface warships but in the past has done little (with the exception of ASW ordnance) to enhance the surface fleet's ability to fight and prevail in harm's way. The first steps are apparently being taken with the current development of India's first indigenous SAM—the *Trishul* (Sharpe, 1991, p. 270). This system will,

however, be of limited capability and the Indian Navy will remain reliant on foreign sources, especially the Soviet Union, for sophisticated AAW and ASUW weapons for at least the rest of the decade. A commitment to the development of hi-tech naval weaponry, apparently not yet a primary goal of the Indian leadership, will be needed to eliminate this area of self-sufficiency weakness for the Indian Navy.

V. EVALUATION OF INDIAN SURFACE FORCES

The model utilized by this study to evaluate the capabilities of the Indian surface force is that presented by RADM J. R. Hill in his book *Maritime Strategy for Medium Powers*. The model evaluates navies on the basis of their capabilities in the following categories:

- Normal conditions
- Low intensity operations
- Higher level operations

Although Hill's model is used to evaluate navies as a whole, this study will utilize that model to address the capabilities of the Indian surface force in particular. Portions of Hill's model that do not pertain to surface ships are omitted.

A. NORMAL CONDITIONS

1. Readiness

In his model, Hill stresses that readiness is of vital importance if a navy is to establish credible deterrence and react to the fast pace of modern naval warfare. Deterrence, according to Hill, "... demands that forces should be capable of credibly effective action against vital interests." (Hill, 1986, p. 88). Measured to this standard, the Indian surface fleet poses a credible deterrent to other regional navies. With more principal surface combatants than any other regional nation (except China, although the PRC Navy is essentially of coastal orientation) (see Table XV), and a willingness to act as demonstrated in the 1971 war and regional crises, India has averted any real naval threat to

its security for 20 years. Additionally, the geographical organization of other Indian fleets into the Eastern and Western Naval Commands, combined with India's ideal geographic location astride major trade routes, places the surface fleet in an excellent position to react quickly to crises requiring naval forces.

TABLE XV. REGIONAL PRINCIPAL SURFACE COMBATANTS (1974-91)

Source: *Jane's Fighting Ships* (1974-1991)

Year	India	Pakistan	China	Australia	Iran	Indonesia	Malaysia
1974	29	7	49	12	11	27	2
1978	28	8	23	12	11	11	2
1982	33	12	35	12	11	10	2
1986	32	8	49	12	11	10	4
1990	38	17	56	12	8	16	4
1991	42	16	47	12	5	17	4

2. Effectiveness

Hill defines effectiveness as being the result of the following:

- Materiel efficiency
- Adequate training
- Organization

In the modern era of hi-tech weaponry and limited reaction time, along with the traditional difficulties associated with operating equipment in a maritime environment, sound procurement and maintenance procedures are essential in order to support a capable naval force. Hill refers to this as "materiel efficiency."

According to Hill's model, in order for a navy to achieve materiel efficiency, naval materiel "... must be within the capacity of the owner state as regards not only initial cost but ability to maintain." (Hill, 1986, p. 90). The more sophisticated equipment will require maintenance and repair capabilities of equal sophistication. The industrial capabilities of the Indian defense establishment, outlined previously, are currently able to adequately maintain the surface fleet with the exception of naval weaponry. Naval SSMs and SAMs are still exclusively procured from foreign sources. With these exceptions, although an Indian writer expressed misgivings about the Indian Navy's readiness (Rikhye, 1990, p. 78), the majority of the open literature supports the view that the surface fleet has the materiel capability to engage in short to mid-duration regional conflicts.

A well-maintained naval force is of little value unless the personnel who operate that force are well trained. The personnel in the Indian Navy are definitely an asset being described by one Indian expert as "highly motivated." (Roy, June 1990, p. 242) The heart of the Indian naval training establishment is the naval training command located at Cochin, along with the majority of training squadrons and professional naval schools (Roy, 1990, p. 72). This command coordinates all the naval training in India. Entry level training is conducted at schools in the Eastern Naval Command. Officer training is conducted at the Indian Naval Academy at Goa (will move to Ezhimala in 1992) and at the new College of Naval Warfare established at Karanja. (Sharpe, 1991, p. 259) In the training arena, the Indian Navy has also moved toward increased sophistication. In 1991, the Indian Navy acquired several state-of-the-art ship simulators. India is the only non-Western nation

to currently have this technology. The simulators provide for enhanced piloting, replenishment and ship maneuver training (*APDR-Newsletter*, 1991, p. 23). The Indian surface fleet routinely conducts exercises in the operating areas of both coasts. These exercises usually stress tactical, amphibious and replenishment operations (Ministry of Defence, 1986, p. 16). Recent exercises have also emphasized ASCM defense (JPRS, 1991, p. 70) The extensive assets devoted to training, combined with the move towards hi-tech training equipment and the general consensus in the Indian naval literature that the training levels of the force are adequate, suggest that the Indian surface fleet has the capability to effectively operate its equipment in a combat environment. An active duty Indian naval officer wrote "... the Navy has built up high levels of technical competence and seamanship, with the ability to operate at considerable distances for extended periods." (Prakash, 1990, p. 62)

The organization of the Indian Navy (Appendix D) is along geographic lines and is conducive to rapid response to the Bay of Bengal, Arabian Sea and, to a lesser degree, the Indian Ocean. The Chief of Naval Staff exercises command through the following flag officers:

- Flag Officer Commanding-in-Chief, Western Naval Command (Bombay)
- Flag Officer Commanding-in-Chief, Eastern Naval Command (Vishakhapatnam)
- Flag Officer Commanding-in Chief, Southern Naval Command (Cochin)

The C-in-C, Western Naval Command is the superior of the Flag Officer Commanding Western Fleet and is responsible for all activities on the western coast. The C-in-C, Eastern Naval Command supervises the Flag

Officer Commanding Eastern Fleet and is responsible for assets based on the eastern coast and in the Andaman and Nicobar Islands. The C-in-C, Southern Naval Command is responsible for maritime operations to the south of India and also is responsible for the Lakshadweep Islands. The Flag Officer Naval Aviation is subordinated to the C-in-C Southern Naval Command. With the completion of the new base at Karwar, the Southern Naval Command may have the proposed Southern Fleet included in its organization (Singh, 1987, p. 18). The organization of the Indian Navy into geographical fleets makes good strategic sense in view of India's long coastline and positional dominance in the region. As shown in Figure 12, the C-in-C (currently only Western and Eastern Naval Commands) has naval bases, facilities, training establishments and shipyards under his command. This organization allows a good deal of autonomy, flexibility and ease of coordination in planning operations and maintenance.

There is a great deal of competition between the Western and Eastern Fleets. Although rivalries of this nature can have unfortunate consequences, the Indian surface fleet seems to have benefitted from this competition in terms of competitive spirit and aggressiveness. Indian naval sources state that, in the 1971 war, each naval command "... operated successfully and acquired an identity of its own, resulting in victory against the enemy on all fronts." (*Sainik Samachar*, February 1990). Although difficult to quantify, the Indian naval organization seems to fulfill the requirement of Hill's model that naval forces need to be "... responsive to political direction, controlled to an appropriate degree by the higher command, coordinated to the best advantage for the operation in hand ..." (Hill, 1986, p. 92).

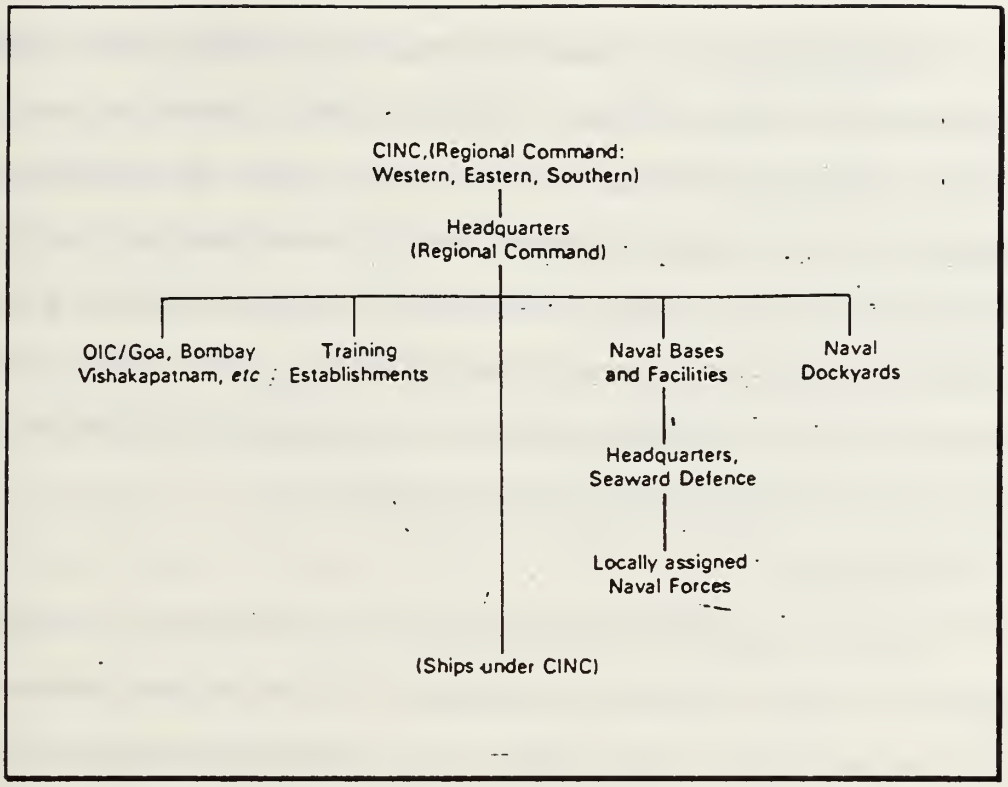


Figure 12. Indian Naval C-in-C Command Organization
Source: Jacobs, 1986, p. 121

3. Intelligence gathering and surveillance

The Indian surface fleet currently has no assets known to be dedicated to intelligence collection. The gathering of intelligence and surveillance, as relates to the surface fleet, are collateral missions undertaken by naval vessels in their patrol areas. Intelligence gathering and surveillance support the following stated missions of the Indian Navy:

- Exclusive Economic Zone (EEZ) surveillance
- "Big Power" navies monitoring
- Coast guard duties (Singh, 1989, p. 56)

Surface ships, due to their slow speeds and limited search capabilities, are inherently unsuited for open ocean surveillance. The continued addition of naval helicopters to the Indian surface fleet will improve search capabilities, but the primary platforms for these missions are, and will continue to be the land-based *Dornier 228, IL-38, TU-142M Bear F,* and *PBN Defender* maritime patrol aircraft (Sharpe, 1991, p. 269). The surface force would be useful in a surveillance role at choice points such as the Malacca Straits, where the area of coverage is relatively small.

4. Presence

As Hill points out in his model, the definition and benefits of presence are hard to describe and quantity. Naval officers have an almost instinctive appreciation of the diplomatic potential of the sight of a warship sailing into a foreign port. One result of presence is the indication of an interest by a nation in the area of presence. Other benefits of presence are to foster goodwill, demonstrate a way of life, deterrence, support for negotiations and for economic activities (Hill, 1986, p. 98) Visibility is a key component of naval presence and, therefore, the best instruments of naval presence are surface warships.

The Indian surface fleet has demonstrated that naval presence is one of its primary missions. During the last decade, Indian warships have made port visits to the following countries: Indonesia, Singapore, Kenya, Japan, Hong Kong, Sri Lanka, Bangladesh, Thailand, the Philippines, Malaysia, Mauritius and many other smaller South Asian nations. In 1987, *INS Godavari* embarked on the longest deployment ever undertaken by an Indian warship. *Godavari* traveled to Europe, Africa, North and South America and

Australia. During this deployment, exercises were conducted with several foreign navies (*Indian Military Yearbook*, 1987-88, p. 95). These port visits and deployments are indicative of a desire of the Indian Navy to be viewed as a credible and respected naval force and of India to be seen as an important regional actor. As one Indian defense expert stated "... the Navy is the only effective instrument to project India's image overseas and to influence the neighbors in the Indian Ocean area ..." (Sojka, 1983, p. 10). A former Indian admiral asserted that deployment and visits are examples of "naval power politics" and "naval influence politics" (Tahliani, 1981, pp. 227-28). The Indian surface fleet's deployment and port visit trends are strong examples of Hill's definition of presence.

5. Constabulary Duties

Hill states that the constabulary duties of a navy are those relating to the enforcement of sovereignty, good order and resource protection (Hill, 1986, p. 99). Although often the function of a nation's coast guard, navies also have a role to play in these areas. In India's case, the constabulary role is expressed as one of the Indian Navy's primary missions. Security of island territories, EEZ policing, maritime boundary monitoring and anti-smuggling operations have all been expressed in Indian naval literature as legitimate roles for the Indian Navy (Roy, March 1990, p. 70) The ongoing acquisition of South Korean offshore patrol ships by the Indian Navy is indicative of the importance of these missions. Aging vessels such as the *Petya II* class frigates and newer units such as the *Pauk II class* corvettes are well-suited for constabulary-type operations. Although the Indian Coast Guard is currently undergoing expansion and modernization, constabulary duties will continue

to be a primary mission for the Indian Navy. The major weakness of the Navy in this type of operation is the relatively small number of vessels with which to monitor large areas of ocean.

B. LOW INTENSITY OPERATIONS

1. Demonstrations of Right

Hill asserts in his model that demonstrations of right are actions taken by navies to assert their rights under international law (i.e. right of innocent passage). Other examples are the exercise of fishing rights and observation of maritime boundaries. Although the term "demonstrations of right" has not been used in Indian naval literature, the Indian surface fleet definitely has the capability in numbers and firepower to assert India's rights in regional waters. The presence and constabulary duties of the Indian Navy outlined previously contribute directly to India's ability to implement international law. Hill outlines three requirements for forces supporting demonstrations of right. These are:

- Sufficient endurance
- Sea or air worthiness
- Handling qualities and manning (Hill, 1986, p. 118).

For operations in the Bay of Bengal, Arabian Sea or northern Indian Ocean, the Indian surface fleet satisfies these requirements.

2. Demonstration of Resolve

Hill asserts that although related to the concept of demonstration of right, demonstration of resolve in situations are usually less geographically focused and less dangerous. The Indian Navy's support of the Indian Army and Air Force in the Sri Lanka intervention, although involving no combat,

was an example of the use of the surface fleet to demonstrate the resolve of the Indian government to prevail in that situation. For similar interventions against militarily insignificant nations, the Indian surface force will be a useful, visible tool with which to demonstrate resolve and commitment to any given policy. Against nations with larger forces, the surface fleet would have less utility as a coercive instrument.

3. Amphibious Landing by Invitation

Hill's model states that invited amphibious landings (i.e. to support a friendly government in a crisis) requires units familiar with the nature of amphibious operations and that have specialized skills. The Indian amphibious forces are definitely more suited for unopposed landings of this nature than for landings in the face of hostile fire. The limitations that the Indian Navy faces in these types of operations are primarily a lack of significant lift capability and of specialized amphibious troops. The current amphibious capability of the Indian fleet can only transport approximately a brigade-sized (2000 man) force to most regional locations. Construction of additional landing craft will increase this capability in the near future. The Indian Marine Special Force (IMSF) was established in 1986 and is primarily a quick-reaction force designed to counter threats to offshore assets and to form the basis of an offensive amphibious capability (Kulkarni, 1991, p. 10). This force is suitable for short-term operations, but would need airborne logistic support for extended operations. The IMSF will be augmented in the near future with the establishment of a planned second brigade (Sharpe, 1990, p. 260). Although this will improve the amphibious capability of the Indian

Navy, only amphibious operations of a moderate nature will be possible for the near term.

4. Evacuation of Nationals

In an era of coups and terrorist operations, navies need to have the capability to evacuate nationals from dangerous situations. The Indian surface fleet has a limited capability to accomplish this type of operation and has demonstrated a willingness to engage in evacuation operations. In January 1986, *INS Godavari* was sent to South Yemen to assist in the evacuation of Indian nationals during the Yemeni crisis. Although evacuation did not become necessary, the deployment was indicative of Indian resolve and was the first active deployment of an Indian warship outside territorial waters in peacetime (Thakur, 1990, p. 4). Future operations of this type involving large numbers of nationals could be supported by Indian commercial cargo and passenger ships, most of which are owned by state-controlled companies and could be available in a crisis (Sojka, 1983, p. 11).

5. Protection of Offshore Installations

The expanding exploitation by India of resources within its EEZ have resulted in an increased desire to be able to protect those resources and the installations engaged in their exploitation. The Indian surface fleet will have an increased role in this arena of naval activity. To illustrate the scope of the problem, one Indian company (Bombay High) currently has seven oil rigs, 18 platforms, 32 support vessels and 400 miles of oil pipeline (Roy, June 1990, p. 239). The developing Indian frigate and corvette programs will provide the Indian Navy with additional resources with which to protect its offshore

installations. This role is well within the capability of the surface fleet to perform against any non-superpower interlopers into India's territorial waters.

C. HIGHER LEVEL OPERATIONS

As illustrated previously, the Indian surface force has a moderate to good capability to perform operations in normal conditions and low intensity operations. Although these operations are important, higher level operations, up to and including naval battles, are where navies "earn their pay." It is in these types of operations where the Indian surface fleet currently has significant limitations as well as some capability. Hill places higher level operations into two general categories: sea use operations and sea denial operations. Sea use operations consist of the following:

- Passage of shipping against opposition
- Amphibious landing
- Shore bombardment.

Sea denial operations consist of:

- Denial of passage
- Denial of sea areas.

1. Passage of Shipping against Opposition

The passage of shipping (maritime trade) against opposition is viewed by Hill as being the most important type of operation during the two world wars. Hill admits that this type of operation has not occurred since 1945, although, since publication of his book, the U.S. engaged in a less intense version of this type of operation in OPERATION EARNEST WILL. In India's case, with enemies traditionally threatening from landward borders

and the relatively short duration of past conflicts, ensuring the passage of shipping has not been a necessity. In any future protracted conflict, however, India's extensive maritime trade could require that this type of operation be conducted. Hill asserts that two requirements exist to conduct passage operations: shipping organization and shipping protection (Hill, 1986, p. 138). The number of Indian ports, combined with a strong merchant marine (834 vessels in 1990), will allow any preplanned organization of convoys to be accomplished without great difficulty. The challenge for the Indian surface fleet will be the protection of those convoys.

The majority of the sea lanes that traverse the Indian Ocean region are within range of land-based aviation assets. In a future war with Pakistan or other regional actors, Indian mercantile assets would be subject to maritime strike operations and the Indian Navy would be faced with the following options to protect the ships under its charge:

- Indian Air Force (IAF) interdiction of enemy aircraft and destruction of bases.
- Indian naval aviation protection of maritime assets.
- Surface ship AAW protection of maritime assets.

The Indian Air Force, a large and capable force, will likely be heavily involved in supporting ground forces and engaging enemy air forces in a future conflict. As one Indian naval writer asserted "... the air force will never have enough aircraft to divert them for naval missions to the detriment of their own requirements for favourable air situation, interdiction, bombardment, air defence and other traditional air force roles" (Birla, 1986, p. 203). In a protracted war, therefore, the Indian Navy may have to rely on organic assets for protection from air attack.

Indian naval aircraft, operating from the two carriers currently in the fleet, would have a significant challenge in establishing and maintaining air superiority around shipping formations being protected. The *Sea Harrier*, although a capable V/STOL aircraft, will have great difficulty engaging high-performance land-based aircraft especially those that are not at the limit of their operational range. This situation is the result of three key weaknesses of Indian naval aviation.

- Relatively low speed of the *Sea Harriers* compared to land-based aircraft.
- Few numbers of aircraft currently deployed on the two carriers.
- Lack of organic airborne early warning (AEW) capability.

It is unlikely, unless the threat axis is well defined, that sufficient numbers of *Sea Harriers* could be vectored to intercepts prior to the weapons release point of ingressing aircraft.

If the Indian Navy's aircraft are unable to successfully interdict inbound air raids, the burden of shipping protection will fall on the surface escorts. This is a challenge that the surface combatants currently will have difficulty meeting. The air search radars of the most capable AAW vessels (*Kashin II* and *Godavari* classes) can detect air targets out to 70 miles. This is a range at which many aircraft (especially Pakistani ASCM-capable aircraft) will have already launched their weapons. Of additional concern is the relatively short range of the Indian Navy's AAW missile systems. The longest range system, the SA-N-1, is deployed aboard the *Kashin II* class and can engage targets at 17 miles. All of the other AAW systems used by the Indian Navy have engagement ranges of less than 10 miles (Sharpe, 1990, p. 265). These short engagement ranges allow for fewer engagements of inbound missiles

on aircraft and greatly decrease the probability of eliminating large numbers of attackers prior to target impact. The reported addition of the SA-N-7 system to the new Project 15 destroyers will still only allow engagements at a range of 15 miles. Although a more modern missile than other systems in the Navy, the short range of the SA-N-7 and the resulting low number of engagements will do little to prevent rapid air defense saturation (Sharpe, 1991, p. 264).

The Indian surface fleet will have difficulty "fighting through" shipping against determined air opposition. To its credit, however, the surface fleet could achieve a good deal of success against regional submarines and surface threats. The majority of Indian surface combatants have ASW capability and many have ASW helicopters embarked. The number of ASW platforms, combined with the R&D emphasis on ASW systems, will give the Indian Navy a credible ASW capability. ASW is viewed by many Indian naval writers as of great importance and receives a good deal of emphasis in training and exercises (Subrahmanyam, 1990, p. 1144). The sinking of the Pakistani submarine *Ghazi* as it stalked *Vikrant* during the 1971 war vividly demonstrated to the Indian Navy the effectiveness of an aggressive ASW strategy. The ASCM capability of Indian surface warships, combined with the ASUW capabilities of the *Sea Harriers* and some helicopters, will make it exceedingly difficult for a regional SAG to launch a devastating attack on escorted shipping formations. The ASUW capability of the Indian surface fleet will be greatly augmented with the planned deployment of SS-N-22 ASMs aboard the Project 15 destroyers (Sharpe, 1991, p. 264). This system will increase the range at which Indian warships can engage adversaries.

In the final analysis, however, the passage of shipping would be faced with superior airpower and, unless assisted by the Indian Air Force or luck, would be very unlikely to be accomplished successfully.

2. Amphibious Landing

The Indian Navy's lack of lift capacity and expertise in amphibious operations would be intensified in an opposed amphibious landing. The lack of effective gunfire support capabilities or doctrine would seem to make the seizure and defense of a beachhead difficult to impossible. Amphibious ships would be vulnerable to the same types of attack as shipping formations outlined previously.

The only likely scenario for success is one where significant numbers of IAF and naval air assets are devoted to close air support, and amphibious troops are put ashore under the protection of these assets. Against a determined adversary, however, opposed amphibious operations have little chance for success. One retired Indian admiral supported this view, asserting that "... at present it is not possible for the Indian naval forces to put across a brigade in a situation of opposition and sustain it over a period of time, let alone enlarge the bridgehead" (Roy, February 1990, p. 1145).

3. Shore Bombardment

Although often associated in Western navies as being a supporting activity for amphibious operations, shore bombardment can also be an operation in its own right. The Pakistani SAG raids against India and the 1971 Indian strikes at Karachi are indicative of shore bombardment being conducted as an independent operation. The primary method that the Indian Navy would employ for shore bombardment operations would be air strikes

from carrier-based aircraft. The effectiveness of carrier air strikes was demonstrated to the Indian Navy by the 1971 raids against East Pakistan. The "iron bomb" capability of the *Sea Harrier* would be effective against shore installations, although the lack of standoff weaponry could contribute to high attrition from AAA and SAM defenses.

In addition to the naval aviation forces, the surface combatant force possesses a moderate shore bombardment capability. Although lacking the numbers and weight for effective NGFS, the gun systems and missile systems of the surface fleet could be effective in strikes against ports, oil installations and other shore targets. This was also illustrated to the Indian Navy in the 1971 raid on Karachi. The success of this type of operation would depend on air cover or surprise (i.e. the Karachi raid).

The shore bombardment mission is the only sea use operation that the Indian surface force is currently technically capable of conducting with a high level of confidence. The primary weaknesses associated with this type of operation are lack of early detection and adequate air defense capabilities. The proximity of the likely operating areas of the Indian fleet to potential adversaries, however, make these weaknesses definite "show stoppers."

4. Denial of Passage

The first of the sea denial operations discussed by Hill is denial of passage. Hill defines these operations as those undertaken to deny an adversary the use of the sea for passage of shipping. According to Hill, denial of passage operations are of growing utility in an era where "... the means of attack are often more cost-effective than the means of protection ..." (Hill, 1986, p. 141).

The Indian surface fleet has a strong capability to accomplish this type of operation. Virtually all of the surface force has some degree of capability to interdict maritime and naval traffic transiting a conflict zone. The naval aviation assets, both *Sea Harriers* and helicopters, equipped with Sea Eagle ASMs have an effective standoff maritime strike capability. The air assets are augmented by the SSM capabilities of the majority of surface warships. The SS-N-2 STYX missile, the primary ASUW weapon of the surface fleet, can engage targets at ranges up to 45 miles. The Indian warships without ASM capability, such as the *Pauk II* and *Petya II* classes, have the speed and gun capability to engage merchant vessels, particularly those transiting choke points or areas near Indian territory. Additionally, many of the Soviet SAM systems deployed on Indian warships have a secondary ASUW capability. These AAW missiles lack the range and warhead size to be effective against naval forces, but have an effective capability against maritime assets.

The denial of passage operations are those for which the Indian surface force is ideally suited. The amount of firepower that can be delivered, along with the almost perfect geographic position of India near regional sea lanes, make the task of protecting shipping from Indian attack exceedingly difficult. As one Indian writer asserted, discussing the 1971 war, the concept of sea denial was "... indelibly etched into India's naval consciousness" (Tellis, Part I 1990, p. 85).

5. Denial of Sea Areas

Hill's concept of denial of sea areas is often referred to as "sea control" by naval strategists. Hill asserts that this type of operation approximates a classical exercise of sea power and is usually the prerogative of the stronger

side in a conflict (Hill, 1986, p. 141). This concept has been articulated by many Indian naval writers, one of whom states that "... sea control in specified areas of interest in the Indian Ocean ..." is a primary objective of the Indian Navy (Prakash, 1990, p. 62).

The geographical position of India is an aid and a detriment to attaining sea control. In the Bay of Bengal area, the port of Vishakhapatnam allows surface forces direct access to their operating areas. The regional navies bordering the Bay of Bengal are relatively weak and could be rapidly neutralized by the Indian surface fleet, given sufficient IAF support. Stronger navies, such as those of Indonesia and Malaysia, are subject to decimation as they attempt to transit the Malacca Straits, which are dominated by Port Blair and other installations at the entrance into the Bay of Bengal. The situation in the Arabian Sea and Indian Ocean is different, however. These areas offer a variety of routes of travel and are significantly larger areas of ocean over which to attempt to exercise dominance. India's traditional naval threat, Pakistan, has only one port (Karachi) which lessens the Indian problem of locating an enemy force in order to destroy it. The drawback, however, is that the close location to India of Karachi allows the Pakistani Air Force to provide air cover for the Pakistani fleet. This air cover would have to be neutralized before the Indian Navy could exert any real measure of sea control over the Arabian Sea. In the Indian Ocean itself, the areas involved are too great to allow the Indian navy to exert sea control except in the areas immediately adjacent to an Indian battle group.

A traditional "fleet vs. fleet" engagement is an unlikely occurrence in the Indian Ocean region. The regional geography and the sophistication of

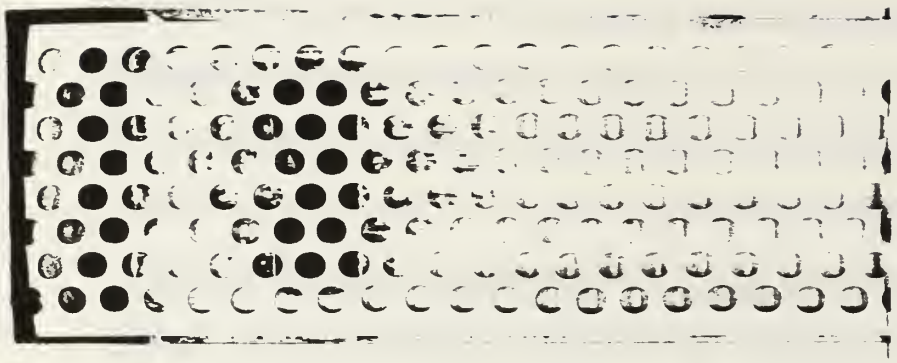
littoral air forces ensure that most naval actions will be combined arms operations. If the Indian surface fleet did engage in combat with any regional navy, without the involvement of land-based air, the numbers and firepower of the Indian force will have the advantage. Currently, although having a surprise attack capability, the Indian surface force would have little chance of defeating a modern Western navy.

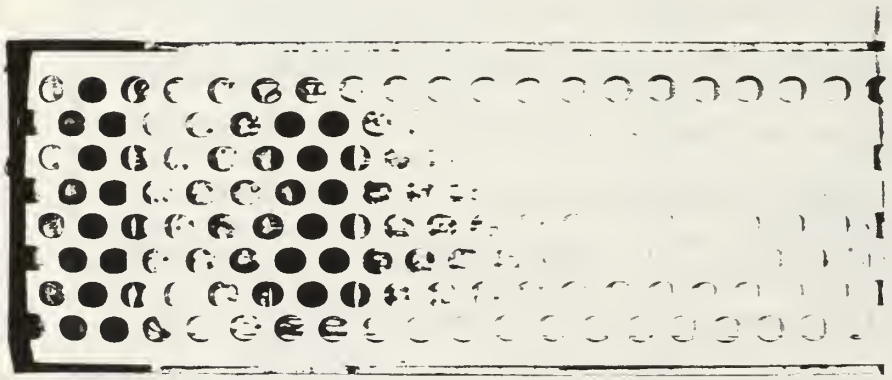
D. STRENGTHS AND WEAKNESSES OF THE INDIAN SURFACE FORCE

A summary of the capability of the Indian surface fleet in various categories of Hill's model is provided in Table XVI. The force has moderate to high capability in most of the normal conditions and low intensity operations categories. When higher level operations are attempted, however, significant weaknesses are evident.

TABLE XVI. CAPABILITIES OF THE INDIAN SURFACE FORCE

CATEGORY	CAPABILITY		
	LOW	MODERATE	HIGH
Readiness			X
Material Efficiency		X	
Training			X
Organization			X
Intelligence Gathering/Surveillance	X		
Presence			X
Constabulary Duties		X	
Demonstration of Right		X	
Demonstration of Resolve		X	
Invited Amphibious Landing		X	
Evacuation of Nationals		X	
Protection of Offshore Installations		X	
Passage of Shipping Against Opposition	X		
Opposed Amphibious Landing	X		
Denial of Passage			X
Denial of Sea Areas		X	
Fleet Engagement		X	





The strengths

1. Strengths

- Large numbers
- Strong industr
- Fleet organiza
- Proximity to r
- Large number
- Large number capabilities
- Only carrier-b
- Large training
- Motivation an
- Decreasing rel
- Extensive base
- Trend toward diesel)
- Average age o

These strengths ma Indian fleet in bat dominant naval for solidify that position

2. Weaknesses

The Indian limit its range, end weaknesses are:

- Lack of AEW
- Lack of suffic

- Lack of effective surface AAW missile system capability
- Lack of sufficient amphibious lift capability and specialized troops for amphibious operations
- Lack of adequate numbers of combat logistics vessels
- Lack of naval gunfire support capability
- Limited indigenous capability to produce naval weaponry

Although not discussed previously, two additional areas of concern have manifested themselves in the last year. In India, several Indian Navy admirals quarreled in public about the professional competence of fellow officers. Additionally, there was a public lobbying contest between admirals competing for the position of Chief of Naval Staff (Sharpe, 1991, p. 57). Whether these are isolated incidents or signs of leadership problems remains to be seen.

The strengths and weaknesses of the Indian surface force have had a significant impact on Indian naval strategy. This strategy, along with indications to determine its future course, are presented in the following chapter.

VI. ROLE OF INDIAN SURFACE FORCE IN CURRENT AND PROJECTED NAVAL STRATEGY

The current strategy of the Indian Navy is not easily discerned from open source official government statements. No official government position, such as the British Defence White Paper, has been promulgated delineating India's naval goals and aims. Analysis of India's naval literature, however, along with the statements of senior Indian naval officers does produce useful insights into current and future Indian naval strategy and the role of the surface fleet in that strategy.

A. CURRENT INDIAN NAVAL STRATEGY

Although phrased in different ways by various authors, the current Indian naval strategy can be summarized as follows:

- To exercise sea control in specified areas of interest in the Indian Ocean.
- To ensure freedom of navigation and security of SLOCs.
- To safeguard interests in contiguous waters, EEZ and island territories.
- To maintain limited power projection capability.
- Deterrence and monitoring of extra-regional navies.

In each of these areas, the Indian surface fleet plays a crucial role.

1. Sea Control in Specified Areas

During its early development, the Indian Navy was a defensive force that emphasized coastal defense and sea denial. In the late 1970s, the concept of sea control began to be advocated in the Indian naval literature. As a former Chief of Naval Staff stated in 1978, "... During war, effective sea control is of paramount importance" (Kohli, 1978, p. 109). This view became

more prevalent in subsequent years. As one Indian naval expert explained "... the Navy's original local sea control and shore defense orientation, which largely emphasized preserving the integrity of India's coastal waters against a Pakistani threat, has given way to a wider assertive naval orientation, including both complete peninsular sea control and preservation of extra-peninsular zones of influence in an all purpose conception now labelled 'defense of the nation's maritime interests'" (Tellis, Part I 1990, p. 87). This view is supported by a statement made by the Indian Chief of Naval Staff, at the commissioning of *INS Viraat* in 1988, declaring that the acquisition of the *Viraat* marked the beginning of a true "blue-water" capability for the Indian Navy and was in keeping with a new doctrine of sea control vice sea denial (Grant, 1989, p. 269).

As discussed previously, achievement of total sea control by the Indian Navy would be difficult to accomplish given the regional air and missile threat. The term "specified areas of interest" suggests either sea control operations in conjunction with the Indian Air Force or, more likely, operations conducted in areas near or beyond the maximum range of regional land-based air.

In open ocean situations against non-major power navies, the Indian surface force could exert a fair degree of sea control. To accomplish this one Indian naval officer wrote, it is necessary to ensure "... the domination of the airspace above and the capability to sanitize the depth below any part of the ocean which may be of interest at a given time." (Prakash, 1990, p. 63). In the absence of hostile land-based air, the Indian *Sea Harriers* with good AAW and ASUW weapons could strike naval vessels prior to ASM launch and could

eliminate surveillance assets deployed against Indian battle groups. In the anti-submarine arena, although open ocean ASW is inherently difficult, the number of ASW helicopters and ASW-capable surface vessels in the Indian fleet suggest a dedicated effort to protect the battle groups from submarine attack. These capabilities notwithstanding, if either land-based air assets or major navies are present, effective sea control of any open ocean area by the Indian fleet is unlikely. Sea control could be achieved to a degree in waters close to India where large numbers of IAF assets may be brought to bear.

2. Freedom of Navigation and SLOC Security

The Indian naval goals of freedom of navigation and SLOC security both require the prevention of SLOC interdiction by a hostile power. In conflicts with regional powers, the Indian surface force has the capability to accomplish this goal. The continued addition of numerous ASUW platforms, along with the establishment of bases in key locations, provide the Indian surface fleet with a strong capability to ensure that the regional SLOCs remain open in a future conflict.

3. Safeguard EEZ and Island Territories

This component of Indian naval strategy has been the subject of many articles in the unclassified literature. The protection of the EEZ has become a matter of increased concern for India as more quantities of oil and valuable minerals have been exploited in India's EEZ. Currently, over 50% of India's oil and 80% of its natural gas requirements are obtained from EEZ assets (Singh, 1991, p. 75). Although a primary mission of the Indian coast guard, the vast area of India's EEZ and the sophistication of regional navies have resulted in a commitment by the Indian Navy, through the use of land-

based surveillance aircraft and surface vessels, to protect India's EEZ from hostile interventions.

The protection of island territories is a key concern of the Indian Navy, given the strategic locations and extended distances from the mainland of many of India's island groups. The modernization and expansion of facilities in the Andaman, Nicobar and Laccadive island groups and the basing of additional surface vessels in these island groups are evidence of the importance of this mission to the Indian Navy.

4. Maintenance of Limited Power Projection Capability

Power projection has been defined by one Indian naval writer as "... amphibious capability and ability to sustain a naval task force in distant waters." (Singh, 1989, p. 57). By this definition, current Indian power projection capability is definitely limited. As discussed previously, the amphibious and logistics capabilities of the Indian Navy are marginal at best. The Indian surface fleet can support limited power projection operations such as protection of island territories and amphibious landings by invitation. Extended or opposed operations, however, are not currently feasible. There is a strong belief among the Indian naval leadership that a power projection capability is required in order to ensure the security of Indian ethnic communities residing in island nations such as the Maldives, Mauritius and the Seychelles (Harrison, 1989, p. 262). This justification, along with the need to protect India's island territories, is a key factor behind the developing amphibious capabilities of the Indian surface fleet.

5. Deterrence and Monitoring of Extra-regional Navies

The naval missions of deterrence and monitoring of extra-regional navies are recurrent themes in Indian naval literature and statements. These two areas of concern are closely related and are the result of an almost paranoic obsession by India not to be humiliated by foreign navies, as occurred when the *USS Enterprise* was deployed to the Bay of Bengal in 1971. Deterrence is often expressed as a major peacetime mission for the Indian Navy. A former Indian Chief of Staff stated that "Looking generally at the Navy's peacetime functions, we find that its primary one is deterrence" (Sojka, 1983, p. 6). Deterrence is also supportive of the monitoring of the extra-regional navies. This is illustrated by the view of the then Chief of Naval Staff who, in 1986, asserted "The Indian Navy cannot expect to prevail against the punch a super power can bring to bear. But we can raise the costs of its intervention. That is what deterrence is all about." (*Indian Military Yearbook*, 1987, p. 109). The emphasis on this mission in the Indian naval literature is indicative of the suspicion and hostility with which India views foreign naval deployments in the region.

The developing capabilities of the Indian surface force would definitely "raise the costs" of outside intervention in the region. As for regional threats, the current force levels and capabilities of the Indian Navy are a credible deterrent to regional nations considering employing naval forces against India.

B. FUTURE INDIAN NAVAL STRATEGY

The future nature of Indian naval strategy is of major concern to regional and extra-regional nations alike. Anxiety over the naval intentions of India

has led several nations in the region to begin naval modernization programs in an attempt to lessen India's naval dominance. Indonesia, for example, although not considered a traditional enemy of India, has begun construction of a new naval base and is in the process of acquiring 24 frigates as a response to India's naval expansion (Nugent, 1991, p. 36). Although future Indian naval strategy is difficult to predict, the political support in India and the views of Indian naval officials support the conclusion that the Indian Navy will continue to develop and play an important role in Indian national policy.

1. Political Support for Naval Development

The Indian political system, although democratic, is characterized by violence, confusion and intense ethnic rivalries. It is surprising that a coherent national security policy can result from this political system. Since the late 1960s, however, a constant policy of nonalignment and naval modernization and expansion has been pursued by New Delhi. Another constant factor has been the support for the Navy articulated by every Indian prime minister over the past 20 years. This was illustrated in the 1980s by Rajiv Gandhi. His view that "The defense of India requires our undisputed mastery over the approaches to India by the sea ..." (Nugent, 1991, p. 29) was representative of the support that the Indian Navy has enjoyed in recent years from the political leadership. The intervention in Sri Lanka and the Maldives indicated an Indian political willingness to be the regional "policeman"—a manifestation of the unofficial "Rajiv Doctrine" (Nugent, 1991, p. 29). The consistent support and naval expansion over the past 20 years, despite internal political conflicts, along with steady real-term funding

increases, suggest a solid base of support for Indian naval growth that will continue in the future.

2. Naval Views of Future Naval Strategy

Not surprisingly, the Indian naval literature is strongly supportive of continued naval expansion. The Indian Navy sees itself as the "front line" against a perceived threat of foreign maritime interventionism. The future Indian naval strategy will probably feature the same components as the current strategy. There are mixed views in the Indian Navy and the region, however, on whether the attainment of these goals will be accomplished by an offensive or defensive naval orientation.

The current Indian Chief of Naval Staff, Admiral L. Ramdas, added to the confusion in June 1991. Ramdas criticized his predecessors for emphasizing "small ship" procurement, asserting that smaller ships were excessively cost-intensive in terms of maintenance and infrastructure and that the Indian Navy now has a goal of attaining a 60:40 ratio in favor of larger ships (presumably destroyer-size and larger) in the next 10-15 years. This policy implies a move toward large displacement vessels that have greater range and are potentially more offensive in nature. In the same interview, however, Ramdas suggested that India may have to enter into regional security arrangements to meet national security needs (*APDR-Newsletter*, June 1991, p. 25). This suggests a more defensive naval orientation, at least for some scenarios. In addition to apparently conflicting statements from the Indian naval leadership, concern about future Indian naval intentions is aggravated by a large number of belligerent statements by Indian naval officers in the naval literature. Statements such as "The surest

way to maintain peace is to occupy a position of menace" (Agashe, 1990, p. 14) are not indicative of a "kinder, gentler" Indian Navy and serve to fuel regional mistrust and suspicion.

The justifications for an expanded Indian Navy also add to regional confusion about India's motives. The rationale behind India's naval expansion is often expressed in amorphous terms that have little apparent validity. The primary naval threats to India, when they are articulated, are considered to be China and Pakistan. These threats, although perhaps credible to the Indian naval leadership, are apparently over-stated. The naval balance of power between India and Pakistan in terms of numbers of combatants, firepower, flexibility and infrastructure is clearly in India's favor. The single Pakistani port of Karachi could be neutralized relatively easily by Indian naval and air assets. The notion that the Pakistani Navy has the capability to coerce India is not credible and provides little justification for a multi-carrier navy. The Chinese Navy, although greater in numbers than the Indian Navy, is essentially a coastal force and has shown little capability or desire to influence events in the Indian Ocean. A former Indian admiral admitted that "China's present capabilities do not allow a naval power projection into the Indian Ocean" (Awati, 1989, p. 109). Additionally, a PRC naval task force would be subject to serious casualties as it attempted to transit the Malacca Straits. As in the case of the Pakistani Navy, the Chinese naval "threat" to India is minimal at best and appears to lack credibility as an argument for an extensively expanded Indian naval force.

Whether the future Indian naval strategy is offensive or defensive in nature, it is apparent that there is a growing appreciation in the Indian Navy

of the diplomatic roles that a navy can play. The support that a strong navy can give to diplomatic maneuvers is another argument for a capable and modern naval force. As one Indian writer stated, the "... ability to employ the use of force at sea will have an impact on the success or failure of diplomacy" (Tahliani, 1981, p. 225). This appreciation of the Indian Navy's diplomatic role is widely held in the naval leadership and suggests that naval "saber rattling" may be a component of future Indian naval strategy and that the Indian surface force will play a key role in that strategy.

C. INDICATORS OF THE NATURE OF FUTURE INDIAN NAVAL STRATEGY

The future nature of Indian naval strategy is difficult to predict. There are, however, a number of intelligence indicators which can serve to illustrate whether the Indian surface fleet and naval strategy will be oriented towards offensive or defensive objectives.

1. Indicators of Offensive Naval Strategy

Forward naval operations can be conducted for offensive and defensive purposes. The U.S. Navy, for example, has long pursued a policy of forward defense—a policy viewed, at least by the U.S., as not offensive in nature. The difference between a forward offensive posture and a forward defensive posture, however, can be murky in the absence of an articulated naval strategy. The validity of a forward defensive posture is often dependent on the geographic situation of a nation and potential adversaries. In India's case, the fact that most regional SLOCs and chokepoints are close to Indian zones of influence would suggest that a forward posture is unnecessary. Future naval adversaries are forced by geography to a few avenues of

approach that are subject to domination by Indian naval and air forces. In the absence of a clear, official naval strategy, an Indian embrace of a forward posture for defensive purposes seems unlikely. Rather, a forward naval posture by India, along with recent historical experience, suggests an offensive strategy to exert influence on the Indian Ocean region. This philosophy, although not officially stated, has been echoed in the Indian naval and general literature—a philosophy that "... Indian Ocean control is India's future" (JPRS, 1989, p. 73).

Although not individually indicative of an offensive orientation, the following developments, should they occur, viewed as a group could be the result of an offensive naval strategy.

- Acquisition of a CTOL aircraft carrier
- Expansion of fleet logistics capability
- Acquisition of organic AEW aircraft
- Acquisition of mid-air refueling capability
- Formation of a southern fleet
- Expansion of amphibious lift capability and marine brigade
- Increase in force totals relative to regional navies
- Increase in out-of-area deployments and exercises
- Development of significant AAW warships
- Maintenance of or increase in existing naval funding levels despite financial hardships

The acquisition of a conventional aircraft carrier with sophisticated strike and fleet air defense aircraft could be a major indication that India is moving toward a more proactive and offensive naval orientation. There are currently conflicting accounts in the literature as to the nature of the carrier

planned to be built at Cochin. CTOL, V/STOL and hybrid configurations have each been suggested. If a CTOL carrier does become part of the Indian surface fleet, the strike capability, range and self-defense capability of such a vessel could have a serious impact upon the regional balance of naval power.

An improved and modernized logistics capability is essential if the Indian surface fleet plans to conduct offensive operations at extended distances from India. There have been statements by Indian naval leaders suggesting that this may be a future goal. As the then Indian Chief of Naval Staff, Admiral J. Nadkarni, stated in 1988, "It is important for the Indian Navy to have large ocean-going ships with good firepower and endurance" (Nadkarni, 1989, p. 56). He added that the Indian Navy should have the capability to operate at distances in excess of 2000 kilometers from India. In view of these statements, the current replenishment vessel construction program, along with the two CLF ships currently in the fleet, will contribute greatly to increasing the range, endurance and sustainability of the Indian fleet.

A current weakness of the Indian surface fleet is a lack of organic AEW capability. Timely warning and location information is essential if a fleet is to conduct successful forward operations outside of the protection of land-based aircraft. As an Indian naval officer stated in 1990, "Lack of airborne early warning (AEW) support at sea is clearly a gap which needs to be filled by the navy to make its carriers more effective and to provide a safer environment for its surface forces" (Prakash, 1990, p. 69). The probable short-term solution to this problem will be the acquisition of AEW helicopters. In 1989 the Chief of Naval Staff confirmed that negotiations were in progress to

acquire AEW helicopters (Nadkarni, 1991, p. 55). As of 1991, five *Sea King Mk 42D* AEW variants have been purchased, with up to nine additional units on order. (Sharpe, 1991, p. 269) It is unknown if these aircraft are as yet operational. Of added interest, the Indian Air Force flew an indigenous AEW prototype, resembling an E-2C, in November 1990 (APDR-Newsletter, February 1991, p. 24). It is unknown if a naval variant of this aircraft is planned. The detection and processing capabilities of AEW aircraft cause them to be expensive assets. The deployment of AEW helicopters or aircraft by the Indian Navy would be indicative of a desire to conduct forward operations in a hostile environment.

An additional requirement for effective naval strike and air defense operations is mid-air refueling capability. This capability allows air strikes from greater distances and more effective use of air defense aircraft—both factors contributing directly to improved survivability for aircraft carriers operating in hostile areas. Currently, neither the Indian Navy nor Indian Air Force have mid-air refueling capability (Samaddar, 1991, p. 5). Although no information is currently available on programs to rectify this shortcoming, mid-air refueling capability will be essential if the Indian surface force plans to pursue an offensive strategy.

The formation of a new Southern Fleet at Cochin would greatly enhance the offensive capability of the Indian surface fleet. The formation of such a fleet would provide the C-in-C, Southern Naval Command, with his own naval forces and will cause that command to become an important operational player in addition to overseeing naval training. A fleet based at Cochin would be closer to Indian Ocean operating areas and would be difficult

for regional navies to interdict. Such a fleet would also allow more dispersal of Indian naval assets, making preemptive strikes more difficult (an Indian version of "strategic homeporting"). Although the establishment of this fleet has not been announced or confirmed, there has been some discussion in the naval literature about the role of a future Southern Fleet. One Indian naval writer stated that, while the Eastern and Western fleets would be responsible for defending India and the EEZ, the Southern Fleet would be "... primarily responsible for safeguarding India's interests further afield" (Birla, 1985, p. 194). This open-ended statement was supported by the assertion that even four aircraft carriers would not be sufficient for the Indian Navy if a third fleet came into existence. It is not certain that a Southern Fleet will be formed. The two existing fleets have a great deal of authority and autonomy and it is unlikely that those commands will willingly give up assets and prestige to a new "strike" fleet. If a third fleet is formed, however, it will be another indication that India is considering a more offensive naval strategy or that Indian military strategy is considering implementation of a more offensive naval component.

Expanded amphibious lift capability and additional amphibious troops are required if the Indian Navy plans to conduct offensive power projection operations. One Indian naval expert has asserted that "... at least three independently deployable brigades, each possessing its own organic strike aviation, fire support capability, command elements, and requisite beachhead and onshore mobility elements" (Tellis, Part I 1990, p. 95) are required in order to conduct offensive operations. Although that level of capability is in the distant future, the current amphibious vessel construction

programs indicate that the Indian Navy is committed to increasing its amphibious lift capability. The proposed establishment of a second marine brigade is indicative that the naval leadership desires to have the future option of conducting power projection operations.

The advantage in numbers that the Indian Navy enjoys over regional nations is already substantial and, given current naval construction programs, will continue for many years. While "bean-counting" alone cannot measure the capabilities of a naval force, in many cases quantity has a quality all of its own. The addition of modern, capable surface combatants without any succinct official rationale will be an indicator that the Indian leadership may be pursuing a more offensive naval strategy.

A professional navy prefers to operate as much as possible in areas in which it may have to operate in a future conflict. For much of its existence, the Indian surface fleet has operated primarily in the Arabian Sea and Bay of Bengal. In recent years however, a number of Indian warships have operated in areas that are great distances from India itself. Although these deployments have been predominantly good will visits, any future conduct of open ocean exercises in areas such as the South China Sea or southern Indian Ocean could indicate peacetime preparations for a forward wartime naval strategy. Additionally, the acquisition of extra-regional bases to support these operations could indicate a potentially offensive strategy. Some reports have indicated an Indian interest in leasing Cam Ranh Bay. Such a development, if it transpired, could signify an Indian desire to provide support for offensive operations (Kassim, 1990, p. 108).

The Indian surface fleet is currently extremely vulnerable to air attack from regional air forces. This weakness is a matter of great concern if the Indian Navy plans future offensive power projection operations. One Indian writer observed that the Falklands conflict had demonstrated the need for "... integrated air cover for a fleet in distant operations" (Awati, 1989, p. 107) Large AAW ships with long-range SAM systems will be essential if the Indian surface fleet is to survive in an adversary's territorial waters. Development of a long-range SAM system (similar to TARTAR or TERRIER), along with the addition of large warships with significant magazine capacities, could be indicative of a more offensive naval strategy.

Continued high levels of funding in the Indian Navy's budget share would also support a commitment to purchasing the numbers of vessels necessary to support offensive operations. Although, since 1971, the Indian defense budget has remained at an almost constant 3.5% of GNP (of which the Navy's share is approximately 13.5%), the Indian GNP has grown significantly since 1978. This has resulted in a steady rise in real terms of defense allocations (U.S. Arms Control and Disarmament Agency, 1990). India's worsening budget deficit situation, however, makes future naval funding increases an uncertain proposition. Some politicians have stated that the heretofore defense establishment "sacred cow" must be sacrificed in order to solve current fiscal problems (McDonald, 1991, p. 34). Indian naval strategy of any orientation will be meaningless unless sufficient funds are allocated to procure assets to execute that strategy. Continued funding of capital-intensive large warships of increasing sophistication, in the face of financial problems, would indicate a national commitment to a strong Indian Navy and a desire

to maintain a fleet capable of offensive operations rather than a less-expensive defensive force. Recent rhetoric and past funding trends lead to the conclusion that a national commitment to a strong naval force exists.

All of the aforementioned indicators would support an offensive, power projection Indian naval strategy. The expanding power projection capability of India's current naval development program is apparently what is causing the most concern among regional nations. As one writer noted "... India's current force development proposals, which emphasize naval power projection capabilities, do appear to exceed the demands of India's national self-defence" (Behm, 1990, p. 16). If India desires to change its belligerent image, it must take concrete steps to indicate that it is pursuing a defensive naval strategy.

2. Indications of a Defensive Naval Strategy

Although many of India's current naval programs support a future offensive strategy, there are several indications that could serve to ease regional fears about India's naval expansion. These indications include:

- Retention of V/STOL aircraft carrier option
- Maintenance of defensive amphibious capability
- Procurement of short-range ASCM-capable warships vice large displacement, high endurance vessels
- Retention of existing fleet structure
- Reasonable logistic support capability
- Continuation of local exercises
- Official articulation of defensive naval objectives

The most dramatic tangible indication that the Indian Navy is pursuing a defensive naval strategy would be the retention of the V/STOL

carrier option. Considerably less expensive than conventional carrier and with significant power projection limitations, the V/STOL carriers of the Indian fleet are, to a large degree, inherently defensive in nature. Future acquisitions of this type of warship would help alleviate regional fears that a naval *"Pax Indica"* is a priority for the Indian leadership.

The maintenance of a moderate amphibious capability suited for defensive purposes would be another indication of a defensively oriented Indian naval strategy. An amphibious force capable of deploying one or two brigade-sized elements would support Indian naval goals of protecting its island territories or evacuating nationals in a crisis. Limiting the amphibious force to this size would contribute to lessening regional concerns about India's power projection intentions.

The procurement of relatively inexpensive, short-range ASW and ASUW vessels would support a defensive naval strategy. The geographic advantages that India enjoys would allow corvette and frigate-size vessels, in conjunction with land-based maritime air assets, to adequately defend India's vital interests. The modern weaponry and excellent basing locations available to the Indian fleet would allow these types of vessels to provide a strong deterrent against extra-regional intervention, as well as a more than adequate defense against other regional navies.

The maintenance of the existing two-fleet structure of the Indian Navy would be another indication that India is pursuing a defensive naval strategy. The existing fleets are ideally situated to defend the main avenues of approach to India. This structure, along with forces in the island groups, makes strategic sense and supports a strong naval defense of India. A

decision against the addition of a third fleet would contribute greatly to avoiding perceived provocation and consequent regional tension.

The maintenance of the logistic force at reasonable levels would be another indication of a defensive Indian naval strategy. The offensive capability of naval vessels is meaningless unless those ships can be sustained with "beans, bombs and bullets" in the combat zone. The current Indian logistics force is indicative of a defensive strategy. If additional vessels are added at regular intervals only to replace aging vessels, the Indian surface fleet will not develop sufficient forward support capability to engage in sustained offensive operations.

The routine fleet exercises currently conducted by the Indian Navy in local waters are indicative of a defensive orientation. If this trend continues, the Indian fleet will not be well-prepared to conduct offensive out-of-area operations and will support the statements of the naval leadership that defense of India is still the primary goal of Indian naval strategy.

The simplest and most significant action that the Indian government could take to assure the region that its naval goals are defensive would be the publication of an official position paper outlining the rationale behind Indian naval development. The current lack of an articulated strategy has been cited by numerous regional writers and officials as a major cause of distrust about India's motives. A coherent statement of naval policy could contribute greatly toward reducing the threatening image of the Indian Navy in the view of other regional nations.

3. Summary

Although offensive and defensive indications have been presented, it is difficult to categorize navies as *only* offensive or defensive in nature. Naval vessels are flexible instruments of national power, and many are suited for a variety of roles, offensive and defensive. To determine the nature of a nation's national strategy, an observer must take into account the motivations and aspirations of the national leadership as well as the force structure and character of the naval forces.

The Indian surface fleet, traditionally defensively oriented, is developing the capabilities to become an offensive power projection force. The construction programs and literary evidence strongly suggest a desire of the Indian naval leadership to improve the capabilities of the fleet to a degree far beyond that sufficient for defensive purposes. The majority of offensive intelligence indications are in the processing of being manifested. The claim by Indian officials that an expanded Navy is needed to conduct coast guard type duties is contradicted by the fact that the Indian Coast Guard is also in the process of major expansion and modernization. In the absence of a credible threat, a major influence on the Indian naval leadership appears to be the belief that a superior navy is essential for India's national pride. An Indian defense analyst explained that "Navies are symbols of power. We want to be a world-class power, so we must have a world-class navy" (Nugent, 1991, p. 30). Although difficult to quantify, these nationalistic aspects of Indian naval expansion are worth considering, along with force structure and capabilities. The desire for respect and treatment as a great power are recurrent themes in the Indian literature. Whatever the motivation, it is becoming readily

apparent that the Indian Navy, and especially the surface fleet, has sufficient capability for defensive purposes and, therefore, the aggressive rhetoric and ongoing programs suggest more ambitious objectives.

VII. REGIONAL REACTIONS TO INDIAN NAVAL EXPANSION AND IMPLICATIONS OF EXPANSION FOR THE U.S.

A. REGIONAL REACTIONS

The dramatic expansion of Indian naval power, without any readily apparent justification, has caused significant concern among India's regional neighbors. The prevailing view seems to be that the momentum of India's naval expansion may cause new rationale for the employment of naval force to be developed by Indian in order to take advantage of its emerging capabilities (Cheung, 1989, p. 19).

Pakistani reaction to India's naval expansion, predictably, has been one of alarm and has led to attempts to improve the capabilities of the Pakistani Navy. The U.S. has traditionally been Pakistan's major naval arms supplier and has contributed significantly to an improved, although still small, Pakistani naval force. HARPOON-capable P-3C aircraft, PHALANX CIWS systems and Garcia and Brooke class frigates are examples of U.S. systems that have added significant capability to the Pakistani Navy. Whether this relationship between the U.S. and Pakistan will continue remains to be seen, especially in light of recent developments associated with the Pressler amendment. It is clear, however, that the Indian Navy remains the primary naval threat to Pakistan and that the continued acquisition of modern systems to counter that threat will be a priority for the Pakistani naval leadership.

China, another traditional enemy of India, is also expanding its navy. This expansion, however, is not a direct result of Indian naval developments. The Chinese Navy remains a defensive, coastal force and has expressed little real desire for a "blue-water" capability (Preston, 1989, p. 78). The major goal of the PRC Navy is to exert some degree of control in the South China Sea. The developing PRC Navy does have a regional impact, however. India has repeatedly cited Chinese naval developments as a major reason for its own naval expansion and other regional actors have expressed misgivings about Chinese, as well as Indian, naval developments (Cheung, 1989, p. 18).

The most vigorous expressions of concern regarding India's naval expansion have been expressed by smaller nations in the region. The ASEAN nations (Indonesia, Malaysia, the Philippines, Singapore and Thailand) have expressed doubts about the need for a powerful Indian Navy and have questioned the intent behind current Indian naval developments. Malaysia's defense minister echoed this concern in 1990, stating his fear that the Indian Navy's development into a blue-water force could tempt India to attempt to exert control beyond the Indian Ocean, such as in the Malacca Straits (Hussain, 1990, p. 20). Other officials have declared that the unstable situation caused by India's naval expansion "... has made every Southeast Asian country aware that it should have its own defense capability" (FBIS, 22 February 1990, p. 41). The emphasis of the ASEAN states, given their limited resources, has been on coordinated naval planning and operations. These activities have usually been conducted through bilateral, rather than multilateral, ties as a result of regional sensitivities. Although the regional nations have not yet formed a formal defense alliance, it is clear that the

Indian naval expansion, and, to a lesser degree, the development of Chinese and Japanese naval power, has contributed to an increased sense of uncertainty and concern in the Indian Ocean littoral and Southeast Asian regions (Cheung, 1989, p. 16).

The regional uncertainty caused by developing Indian naval power has resulted in a strong expression in the literature that the U.S. should continue to maintain a presence in the region. Several officials have stated that U.S. presence is desired to prevent a power vacuum that India may attempt to fill (FBIS, 13 March 1990, p. 34). The changing regional balance of power resulting from U.S. force level reductions and reduced Soviet naval presence, as well as developing Indian naval capabilities, is of great concern to regional nations and is a problem that should be addressed by U.S. policy makers.

B. IMPLICATIONS OF INDIAN NAVAL EXPANSION FOR THE U.S.

The security and stability of the Indian Ocean region and its effect on the western Pacific region have long been of strategic significance to the U.S. It follows that the emergence of a modern Indian surface force with the apparent goal of attaining power projection capability is also of strategic significance to the U.S. To avoid misjudgement, decision makers should consider the capabilities of the Indian surface force in both adversarial and allied roles.

1. Capabilities of Indian Surface Force in Adversarial Role

The superior capabilities of the Indian surface force vis-a-vis regional navies and its ability to operate from bases in close proximity to regional SLOCs could potentially affect U.S. and allied interests in the event of a future crisis. Although U.S. interests seem unlikely to be deliberately attacked by

Indian naval forces, the possibility exists that U.S. and Indian forces may encounter each other in one of the following scenarios:

- Accidental attack incidental to regional tension (i.e. *USS Stark*)
- U.S. intervention to prevent dismemberment of friendly nation engaged in losing conflict with India
- U.S. intervention to protect SLOCs during regional conflict (i.e. Indian vs. Pakistan or the PRC)

While the Indian surface fleet does not have the capability to defeat a major U.S. naval force, regional hostilities involving Indian naval forces could endanger smaller naval groups and maritime traffic, particularly if hostilities come about with little warning or were the result of accidental engagements. Although the traditional U.S. carrier battle group (CVBG) would be relatively invulnerable, hostilities could potentially endanger smaller surface action groups (SAG) and amphibious forces that will become more commonplace under the new U.S. defense strategy. The smaller missile combatants of the Indian fleet could pose a threat close to India's coastline; the primary risk to U.S. interests, however, would come from Indian power projection assets–CVBGs, SAGs, and, to a lesser degree, amphibious forces. (NOTE: Although not addressed in this study, the 19 diesel submarines of the Indian Navy would also be a major threat to U.S. forces in the region.)

a. CVBG Potential Threat

The primary offensive capability of the Indian surface fleet is centered around the two aircraft carriers. Their *Sea Harriers* can strike naval targets at distances of up to 250 nautical miles employing conventional bombs, rockets and SEA EAGLE ASMs. Both carriers also employ ASM-capable *Sea King* helicopters with a range of 300 nautical miles. Although

these systems would pose a minimal threat against alerted U.S. warships, they do provide an excellent strike capability against merchant shipping and unalerted naval vessels.

The Indian concept of CVBG composition differs significantly from that of the U.S. Rather than deploying a heavy screen of escorts around the carriers, the Indian naval leadership feels that "Aircraft carriers can and must operate singly in smaller navies with one or two attendant destroyers, tactically maintaining a high speed of advance ..." (Roy, March 1990, p. 73). This philosophy, although possibly arising from the heretofore lack of sufficient numbers of escort vessels, suggests that the carrier escorts must have multiple mission capabilities if they are to adequately protect the carriers. The best candidates in the current Indian naval inventory for the escort role appear to be the *Kashin II* class destroyers (and PROJECT 15 ships when they become available) and the *Godavari* and *Leander class* frigates.

The *Kashin II* class destroyers provide the best AAW defense for the Indian fleet. The SA-N-1 system (17 nm range) provides the nearest thing to an area air defense capability that the Indian Navy possesses. Although lacking the ability to engage sea-skimming missiles, the SA-N-1 could be effective against maritime patrol aircraft (MPA), helicopters, or non-standoff tactical aviation assets that come within range. Of additional importance in the CV escort role are the ASW capabilities of the *Kashin II* destroyers. Hull-mounted and variable-depth sonar (VDS) systems, along with either a KA-25 Hormone or KA-28 Helix ASW helicopter, give these ships a respectable submarine detection and engagement capability (Sharpe, 1990, p. 265).

The three *Godavari* class frigates provide the Indian CV with somewhat less AAW but slightly better ASW protection than the *Kashin II* destroyers. The primary AAW defense, the SA-N-4, provides adequate point-defense capability for the frigates themselves, but provides no significant AAW protection for the CVs. The strength of the *Godavari* class is the ASW suite. Modern hull-mounted and VDS systems provide excellent submarine detection and tracking capability. Additionally, this class embarks two helicopters (usually *Sea Kings* with dipping sonars) that allow standoff detection and attack of hostile submarines (Sharpe, 1990, p. 267).

The *Leander* class frigates are the last group of current Indian ships that are legitimate contenders to be included in the CV escort force. Although the Dutch air search radar carried by the *Leander*s allows detection at ranges out to 145 nautical miles, the SEACAT missile system is only useful for point-defense. The ASW capabilities of these vessels consist of hull-mounted and VDS systems, as well as one *Sea King* ASW helicopter for standoff prosecution (Sharpe, 1990, p 267).

The Indian CVBG, although lacking the capability of a U.S. battle group, should be viewed as a capable force. *Sea Harriers* and *Sea Kings* employing standoff weapons, along with the SSM capability of the escorts (*Kashin II, Godavari* and *Leander* units all field SS-N-2B or C variants with a range of 25 or 45 nautical miles respectively) could potentially interdict maritime and naval assets transiting regional chokepoints, such as the Malacca Straits, or on the open ocean. This strike capability will be enhanced with the addition of a third Indian carrier in the mid-1990s. The ASW capabilities of the escorts, along with numerous ASW helicopters operated

from the carriers, would complicate the task for a submarine attempting to close the battle group, especially if the approach route were dictated by regional geography. The AAW systems, primarily the SA-N-1 and *Sea Harriers* in CAP roles, although second-rate by U.S. standards, would require tactical aircraft to utilize standoff weapons such as HARPOON or EXOCET, rather than cheaper and more numerous "dumb bombs" in any attack on the carriers. The numerous point-defense missile and gun systems of the Indian CVBG would require that significant amounts of ordnance be expended to ensure defense saturation and at least "mission kills" of the Indian ships. This could have serious logistical implications in a "come as you are" regional conflict.

b. SAG Threat

The Indian surface combatants that are not utilized as CV escorts are capable of presenting a serious threat to naval forces by deploying in SAGs. The naval facilities on both Indian coasts, as well as island bases, allow the majority of surface combatants to operate within unrefuelled range of the Malaccan Straits, Straits of Hormuz, and approaches from Diego Garcia. In addition to the combatants mentioned previously, the *Whitby* and *Petya II* class frigates, as well as the *Tarantul, Khukri, Pauk II* and *Nanuchka* class corvettes are the forces that would likely comprise an Indian SAG.

The two *Whitby* class frigates, although over 30 years old, were modernized in the early 1980s with the addition of three SS-N-2A SSMs to present a respectable ASUW threat. Secondary ASUW and limited AAW capability is provided by four 30 mm guns. Additionally, these vessels employ a hull-mounted sonar in conjunction with a *Chetak* helicopter for

ASW defense. The *Whitby* class would be most dangerous to assets if they deployed with AAW-capable ships or under the protection of land-based air.

The six remaining *Petya II* class frigates, like the *Pauk II* class, present an ASUW threat primarily to merchant shipping. Four 76mm guns and ASUW torpedoes that this class carries pose a credible maritime interdiction threat. This class, however, would not be a serious threat to warships.

The six *Tarantul* class corvettes are modern warships with excellent ASUW capabilities. Four SS-N-2C SSMs and a 76mm gun, combined with high speed, make these vessels ideal platforms for chokepoint interdiction. The *Tarantul* class, however, lacks any significant AAW or ASW capability and are vulnerable to air or submarine attack. Additionally, as a result of small displacement and limited endurance, this class is likely to be confined to operations in the Bay of Bengal, where sea states are usually lower and logistic support is available from coastal facilities or from Port Blair. The primary threat of this class would be to maritime traffic or unalerted warships transiting the Malacca Straits on the Bay of Bengal SLOCs.

The four *Khukri* class corvettes (with three building) are Indian-designed vessels with a primary mission of ASW. The ASUW capability of this class consists of four SS-N-2C SSMs and a 76mm gun. An operational radius of 2000 nautical miles allows the *Khukris* to be employed at all regional chokepoints or on the open ocean. With only a point-defense SAM system, however, this class is vulnerable to air and surface missile attacks.

The four *Pauk II* class corvettes are essentially only an ASUW threat to merchant shipping passing close to the Indian coast or near bases

such as those in the Andamans and Laccadives. The one 76mm gun is adequate for engaging unarmed vessels but is of little utility in an engagement with opposing warships. Although possessing an elementary VDS system, the ASW armament of torpedoes and RBU-1200 mortars is unlikely to pose a serious threat to any attacking submarine. As with most Indian surface combatants, AAW armament is lacking and this class represents little threat to U.S. naval forces.

The three Soviet-built *Nanuchka II* class corvettes are dedicated ASUW platforms with a primary armament of four SS-N-2B SSMs. The light displacement of these vessels and a relatively short operating range suggest that they would be best employed against vessels in the Bay of Bengal or transiting the Malacca Straits. The *Nanuchka* class, having no ASW capability, are totally vulnerable to submarine attack, and the SA-N-4 AAW system provides only point-defense protection from standoff attack by opposing air assets.

Assuming that one-third of these surface combatants are available at any one time, and that the destroyers, as well as *Godavari* and *Leander* class frigates, are allocated for CV escort duties, the likely composition of Indian SAGs can be postulated. A SAG operating from Vishakhapatnam or Port Blair to interdict traffic in the Bay of Bengal on the Malacca Straits might consist of:

- 2 *Tarantul*
- 2 *Pauk II*
- 1 *Nanuchka*
- 2 *Petya II*

A SAG of this composition would have the capability of conducting significant ASUW activity against opposing assets. A minimal strike capability of 12 SSMs, as well as significant gun assets, could cause serious damage to merchant vessels or unalerted naval forces. This SAG would, however, be entirely dependent on land-based air (assuming that the *Sea Harriers* are not in the vicinity) for AAW protection and could be successfully neutralized by air strikes.

A SAG operating from Bombay or Cochin to interdict the Arabian Sea or southern approaches would likely be limited due to the heavier sea states in that area, as well as the range from Indian ports to the following:

- 2 *Khukri*
- 1 *Whitby*

A SAG of this composition could launch up to eleven SSMs and would have a respectable ASW capability. It would, however, be vulnerable to air and surface strikes. These projected SAG compositions are definitely "worst-case scenarios" from an Indian readiness point of view. The ASUW, ASW and AAW capabilities of these groups would be greatly increased if more than one-third of the vessels were operationally available at the time and the destroyers were not all engaged in CV escort duties. The continued development at island bases will allow more flexible positioning of these SAGs and present the operational commanders with more tactical options. The striking power of these SAGs will also increase as additional *Khukri* and *Tarantul* class corvettes, as well as the Project 15 destroyers become available throughout the 1990s. Additionally the Indian Navy's force of 12 OSA I and OSA II missile boats, although not addressed in this study, could strike

maritime targets passing within 400 nautical miles of the Indian coast. It is apparent, however, that the small displacement of many of the frigates and corvettes preclude their use in the Arabian Sea or Indian Ocean, especially during the monsoon season. The primary threat posed by an Indian SAG is not a "fleet vs. fleet" engagement, but rather separate ASUW strikes at merchant and isolated naval assets such as CLF shuttle ships. Although not as sophisticated or as capable as, say, a U.S. or Soviet SAG, these forces, aided to a large degree by regional geography, have the capability to inflict serious casualties in a future conflict, particularly if they are dismissed as being part of just another "Third World" navy.

c. Amphibious Potential Threat

The amphibious forces of the Indian Navy are the least capable assets of India's surface force. The present force of two *Magar* class LSTs, nine *Polnochny* class LSMs and seven *Vasco da Gama* class LCUs are essentially capable of only unopposed operations within 100 nautical miles of their bases. The lack of NGFS capability and sufficient numbers of amphibious-trained personnel seriously limits the threat that this force could pose. The most likely danger would be to merchant vessels or foreign nationals that were located in a regional nation (i.e. Sri Lanka) at the time of an Indian amphibious operation. The amphibious capability of the Indian surface force will continue to develop, however, as additional assets are added in the next few years.

2. Capabilities of Indian Surface Fleet in an Allied Role

Given the relatively unlikely prospect for an Indo-U.S. conflict, the developing Indian surface force may be of more interest to U.S. planners as a

potential ally than as an adversary. Although serious political obstacles would have to be overcome, primarily tensions between India and the PRC or Pakistan, a naval security arrangement involving U.S., India and the PRC or other regional nations could have beneficial results for all concerned. Then Indian Chief of Naval Staff Admiral Nadkarni admitted in 1991 that India may have to enter into regional security arrangements in order to meet its security requirements—a sentiment echoed by his successor (Nadkarni, 1991, p. 44). Although such an arrangement is envisioned with only regional nations, India could possibly be convinced that the U.S. could contribute to regional security. In addition to enhanced regional security, the benefits to the U.S. Navy of such an arrangement would be in the following areas:

- Combined exercises/operations
- Logistic support
- Naval presence

a. Combined Exercises/operations

In an era of declining U.S. naval forces, a collective naval security arrangement might enable the warships of India and other littoral nations to replace to a degree, U.S. assets that will not be available. Combined naval exercises and operations with regional nations will, as suggested by SECNAV, CNO and CMC, allow the U.S. Navy to "... facilitate cooperation and coordination with them and to maintain our own expertise in likely operating environments." (Garrett, 1991, p. 39)

Combined operations with Indian CVBGs, SAGs and amphibious forces might provide several advantages to U.S. forces in the region. First, operations with the Indian carriers would assist the U.S. in evaluating the

performance of naval V/STOL aircraft in roles other than close-air support (i.e., CAP, ASUW). This should facilitate the development of tactics to counter these aircraft, as well as promote the evolution and possibly expanded use of V/STOL aircraft in the U.S. Navy. Second, ASW exercises and operations with Indian surface vessels would allow the U.S. to benefit from extensive Indian experience in ASW operations against the diesel submarine threat in shallow water—an area of ASW in which the U.S. Navy acquires little routine exposure. Third, operations with Indian amphibious forces might give U.S. planners added options when dealing with regional crises. An example might be a regional coup scenario requiring rapid evacuation of U.S. citizens, in which Indian forces could be used if a U.S. ARG were not in close proximity. Fourth, agreements with India could provide the U.S. Navy with access to regional training ranges and operating areas, facilitating improved training of U.S forces in the region. Finally, combined operations and exercises with the Indian navy, as well as other littoral navies, could facilitate a spirit of trust and cooperation between the U.S. and India and among the regional nations. The opportunity to observe regional naval activities could reduce uncertainty in the region and increase the chances for peaceful coexistence if a suitable basis for cooperation were found.

b. Logistic Support

In the event of a U.S./Indian naval security agreement, Indian logistic support could potentially become accessible to U.S. naval forces operating in the Indian Ocean region. The facilities of naval bases in Bombay, Cochin and Vishakhapatnam, along with port facilities in Goa, Calcutta and

Karwar, could provide mid-deployment support to U.S. forces in a manner similar to support provided by similar overseas facilities. Political overtones notwithstanding, this support could provide U.S. commanders with greater flexibility when planning battle group replenishments and ease the burden on the always overtaxed U.S. logistics assets.

c. Naval Presence

The last major advantage that a U.S./Indian naval agreement would give the U.S. is one of enhanced naval presence. The sight of an Indian carrier accompanied by U.S. and other regional escorts in a combined task force could serve to soothe regional anxieties over the intent of India's naval expansion. Even the perception of Pakistani and Indian naval forces operating together with U.S. forces (as "adult supervision") might result in a lessening of regional tensions and an increased level of mutual trust—factors that would serve the U.S. desire for security and stability in the region, if properly addressed with the PRC.

d. Advantages for India

The Indian Navy stands to gain as much, if not more, than the U.S. Navy from a regional security arrangement. During a period when some Indian politicians have complained that there is "... just no money for the ambitious plans of the armed forces in general" (Gupta, 1989, p. 42), such an arrangement could contribute to addressing India's security concerns and need for naval presence without requiring additional large monetary expenditures. Given the fact that the Indian Navy's desire that extra-regional powers vacate the Indian Ocean is unlikely to be realized, a security arrangement between the U.S. and India would allow the Indian Navy to

monitor U.S. activity and provide reassurance as to the non-aggressive intent of U.S. policy, while providing a suitable counterbalance to a perceived PRC desire to exert regional influence. The Indian Navy would also gain insight into carrier battle group operations and other aspects of how larger navies function. Closer relations with the U.S. Navy could also result in the Indian acquisition of U.S. naval technologies (such as the GE LM2500 gas turbines currently being license-built for the PROJECT 15 destroyers). Finally, revenues from logistical support of U.S. naval forces might be welcomed in light of India's current financial problems that have resulted in a decline in operations and maintenance funds for the Indian Navy (Gupta, 1989, p. 43).

3. Recommendations

The following are recommendations for U.S. policy makers to make best use of the capabilities of the Indian Navy in general and the surface force in particular:

- Convene a strategy conference and examine options to enhance regional security through the use of naval forces.
- Continue military and diplomatic support to Pakistan to allay potential fears of abandonment resulting from closer U.S.-Indian relations.
- Initiate a US-PRC dialogue to show that U.S.-India cooperation is a sound approach to enhanced regional stability.
- Encourage India to present an official position paper clearly defining the intent of the current naval expansion. This would do much to allay regional fears and to develop a basis for U.S.-Indian, as well as regional, naval cooperation (Conboy, 1990, p. 4).
- Continue meetings between Indian and U.S. military experts such as those held as the U.S. National Defense University in 1989 (Conboy, 1990, p. 11).
- Suggest an enhanced port visit program of U.S. ships to Indian ports and invite reciprocal visits by the Indian Navy.

- Convene meetings between regional naval and diplomatic leadership to discuss the roles that could be played by a regional naval force similar to, although not necessarily as structured as, STANAVFORLANT.
- Invite the Indian Navy to operate one or two vessels with U.S. forces as a preliminary gesture of goodwill and cooperation.
- Suggest the possibility of increased U.S. technical cooperation with the Indian Navy in exchange for occasional use of Indian facilities.

Although these recommendations are only starting points and are sure to encounter significant political difficulties, they could, if implemented, go a long way towards establishing an atmosphere of trust and openness between the U.S., India and other Indian Ocean littoral nations. Over time, it could lead to combined naval force operations in some scenarios. The creation of a more stable Indian Ocean region will take time and trust, but will not occur unless preliminary steps are taken. Closer ties between India and the U.S. developed simultaneously with improved relations between the U.S. and China could also serve to prevent future Sino-Indian conflicts and contribute to U.S. goals of stability in the Indian Ocean region as well as the western Pacific. The potential benefits of improved relationships between the U.S. and India are significant and well worth the diplomatic initiative required. Rapprochement between India and China, considered by India to be its major threat, will be a difficult diplomatic accomplishment. A regional security agreement between the U.S. and India, however, along with improved Sino-U.S. relations, could place the U.S. in the position of "middle man" and potentially allow the U.S. to play a major role in the pursuit of regional security.

Both the U.S. and Indian navies are currently facing some similar problems. Budgetary pressures, political assault about the lack of a "real" enemy and an uncertain future force structure, conflicting with a desire for security and stability in a volatile world, make the planning process for the U.S. and Indian naval leadership a difficult one. The U.S. is faced with the choice of continuing the heretofore strained relationship with India, which was primarily a result of U.S.-Pakistan, Indo-Soviet relationships and the PRC factor, or actively moving to establish closer ties with India. It would seemingly be to the advantage of the U.S. to attempt to develop closer economic, cultural and military ties with India. An improved relationship between the U.S. and India could foster regional stability and trust—especially in regard to Indo-Pakistani and Indo-PRC tensions. Without some type of regional forum, the developing naval competitions between India and other regional actors (Pakistan, PRC, Indonesia, etc.) could become a self-fulfilling avenue to full-scale conflict, loosely analogous to the Anglo-German naval competition prior to World War I. For an improved relationship to occur, however, India must be willing to reciprocate. That there is potentially hope for the future was illustrated by Admiral Nadkarni when, in an October 1990 address to the U.S. Naval War College, he stated "... I dare say that you will find that the interests of your country and those of mine, in the Indian Ocean area, will increasingly coincide as the years go by" (Nadkarni, 1990, p. 7). The Indian Ocean interest of the U.S. and of India will be better served if a spirit of friendship and cooperation can be nurtured. Increased bilateral contacts between the U.S. and Indian and the development of some shared interests

with other regional navies could form the basis of a stabilizing and mutually beneficial regional security relationship.

VIII. CONCLUSIONS

The continued development of the Indian surface fleet into a modern, power projection force will have significant implications for U.S. Indian Ocean policy. The strategic importance of the Indian Ocean region to the U.S. dictates that the emergence of a relatively dominant regional naval force, with unclear strategic aims, be viewed with watchful interest. The developing power projection capabilities of the Indian surface fleet, combined with the key geographic location of India and the lack of a concisely articulated naval strategy, necessitate that the U.S. stay abreast of India's growing naval potential.

The Indian surface fleet, evaluated in the context of Hill's model for medium naval powers, has moderate to high capabilities in most aspects of normal, low intensity and higher level operations. The Indian surface fleet's capabilities in all areas will improve as new construction warships and indigenous systems become operational.

The industrial support for the Indian surface fleet, such as shipyards, national industry and R&D, is developing at a rapid pace and is already fielding systems of high quality. The reliance of the Indian Navy on foreign suppliers will steadily decrease as industrial developments continue and, except in some weapons categories, will provide the Indian fleet with a high degree of self-sufficiency by the end of the decade.

The Indian surface force is already superior in numbers and sophistication to other regional navies. It is the only littoral naval force that has a carrier strike capability. Current weak areas of logistic support and

vulnerability to air attack are steadily being rectified. By the end of the decade, the majority of the Indian surface force deficiencies will have been corrected to a large degree.

The current Indian naval strategy, although not officially articulated, emphasizes EEZ security, monitoring of extra-regional navies, sea control in specified areas, and limited power projection. This emphasis will continue in the future, although there are many indications, such as organic AEW development, logistics force expansion, enhanced amphibious capability and the possible acquisition of a conventional aircraft carrier, that suggest a more proactive, offensive future naval posture. These developments, supported by rhetoric from naval and political sources, suggest that the Indian Navy sees itself playing a larger regional role in the future.

Regional reactions to India's naval developments have been an almost universall chorus of concern and apprehension. Many littoral nations have begun to bolster their own naval forces to counter India's naval expansion . There is some danger that a self-fulfilling regional naval arms race, roughly analogous to the Anglo-German arms competition prior to World War I, could lead eventually to a naval conflict.

The Indian naval developments could have implications for U.S. regional policy. While the Indian surface force is capable of putting U.S. and friendly maritime interests at risk, it is of potentially greater significance as a regional asset to the U.S. Military and diplomatic initiatives between the U.S. and India could result in a naval security arrangement that could satisfy the two countries mutual goals of regional stability and security. Improved relations with India simultaneous to closer Sino-U.S. cooperation, could

allow the U.S. to play a major reassurance role in promoting stability in the Indian Ocean and western Pacific regions.

The developing naval power of the Indian surface force cannot be ignored by U.S. policy makers. The nature of the future relationship between the U.S. Navy and the Indian Navy will depend on the relationship between the two governments. The Indian naval expansion is indicative of an emerging sense of national identity and importance—a sentiment becoming more common in many Third World nations. While maintaining prudent planning hedges against unhappier alternatives, the U.S. should exert every effort to understand and communicate with India. If a fraction of the diplomatic effort heretofore applied to the Soviet Union were applied to India, there is every reason to hope that the U.S. could achieve a beneficial relationship with the dominant power in the Indian Ocean.

APPENDIX A. INDIAN SHIPBORNE AIRCRAFT

Source: (Sharpe, 1991, p. 269)

1. BRITISH AEROSPACE *SEA HARRIER FRS MK 51* (+ 3 MK60 TRAINERS)

NUMBER:	23 with 7 on order	
SPEED:	640 knots	
CEILING:	51,200 ft	
RANGE:	800 nm maximum	
ROLE:	Fleet air defense/strike/reconnaissance/future ASUW role	
SENSOR:	Ferranti Blue Fox air intercept radar; limited ECM	
WEAPONS:	2	Magic Matra AAM
	2	30 mm Aden cannon
	2	Sea Eagle ASM
	3.6 tons of "iron bombs"	
SQUADRON:	300 (Goa)	

NOTE: Mid-life update planned after 1995

2. WESTLAND SEA KING MKS 42/42A

NUMBER:	7
SPEED:	112 knots
CEILING:	11,500 ft
RANGE:	664 nm
ROLE:	ASW for lage escorts and CVs
SENSORS:	MEL search radar
	ALCATEL dipping sonar
WEAPONS:	4 ASW torpedoes
	BAe MkII depth bombs or mines
SQUADRON:	330 (Cochin)
	336 (Cochin)

3. WESTLAND SEA KING MKS 42/42B/C/D

NUMBER:	20	Mk 42B
	5	Mk 42C
	5	Mk 42D
SPEED:	112 knots	
RANGE:	664 nm	
CEILING:	11,500 ft	

WEAPONS:	ASW: 4 torpedoes, depth bombs or mines (Mk 42B only) ASUW: 2 Sea Eagle ASM (Mk 42B only)
ROLE:	Mk 42B ASUW Mk 42C Assault/Vertrep Mk 42D AEW
SENSORS:	Mk 42B—MEL search radar Thomson Sinatra H/S-112 ESM equipment Mk 42C—Bendix weather radar Mk 42D—Thorn EMI search radar Racal MIR-2 radar
NOTE:	Total of up to 15 Mk 42D planned

4. AEROSPATIALE (HAL) SA 319B *CHETAK* (*ALOUETTE III*)

NUMBER:	10
SPEED:	113 knots
RANGE:	290 nm
CEILING:	10,500 ft
ROLE:	ASW/carrier SAR/utility/assault support
SENSORS:	Some equipped with search radar
WEAPONS:	ASW—2 torpedoes
SQUADRON:	321 (Goa); 331 (Cochin)

5. KAMOV KA-25 HORMONE

NUMBER:	5
SPEED:	104 knots
RANGE:	217 nm
CEILING:	11,500 ft
ROLE:	ASW for Kashin II class destroyers
SENSORS:	Search radar Dipping sonar Sonobuoys
WEAPONS:	ASW–2 torpedoes or 4 depth bombs
SQUADRON:	333 (Goa)

6. KAMOV KA-28 HELIX

NUMBER:	18
SPEED:	110 knots
RANGE:	270 nm
CEILING:	12,000 ft
ROLE:	ASW for new generation escorts
SENSORS:	Search radar dipping sonar Sonobuoys

WEAPONS: ASW—2 torpedoes or 4 depth bombs
NOTE: Total of 18 ordered to replace Ka-25.

APPENDIX B. INDIAN SURFACE COMBATANT AND SUPPORT FORCES

Source: (Sharpe, 1991, p. 262-270)

AIRCRAFT CARRIERS

Vikrant.....R11
Viraat.....R22

DESTROYERS

Rajput.....D51
Rana.....D52
Ranjit.....D53
Ranvir.....D54
Ranvijay.....D55

FRIGATES

Godavari.....F20
Gomati.....F21
Ganga.....F22
Nilgiri.....F33
Himgiri.....F34
Udaygiri.....F35
Dunagiri.....F36
Beas.....F37
Talwar.....F40
Taragiri.....F41
Vindhyagiri.....F42
Trishul.....F43
Arnala.....F68
Androth.....F69
Anjadip.....F73
Amini.....F75

CORVETTES

AMPHIBIOUS FORCES

Mangala.....L39
Unnamed.....L40

SUPPORT FORCES
Deepak.....A50
Shakti.....A57
Rajaba Gan Palan .....building
Poshak
Puran
Pradhayak
Purak

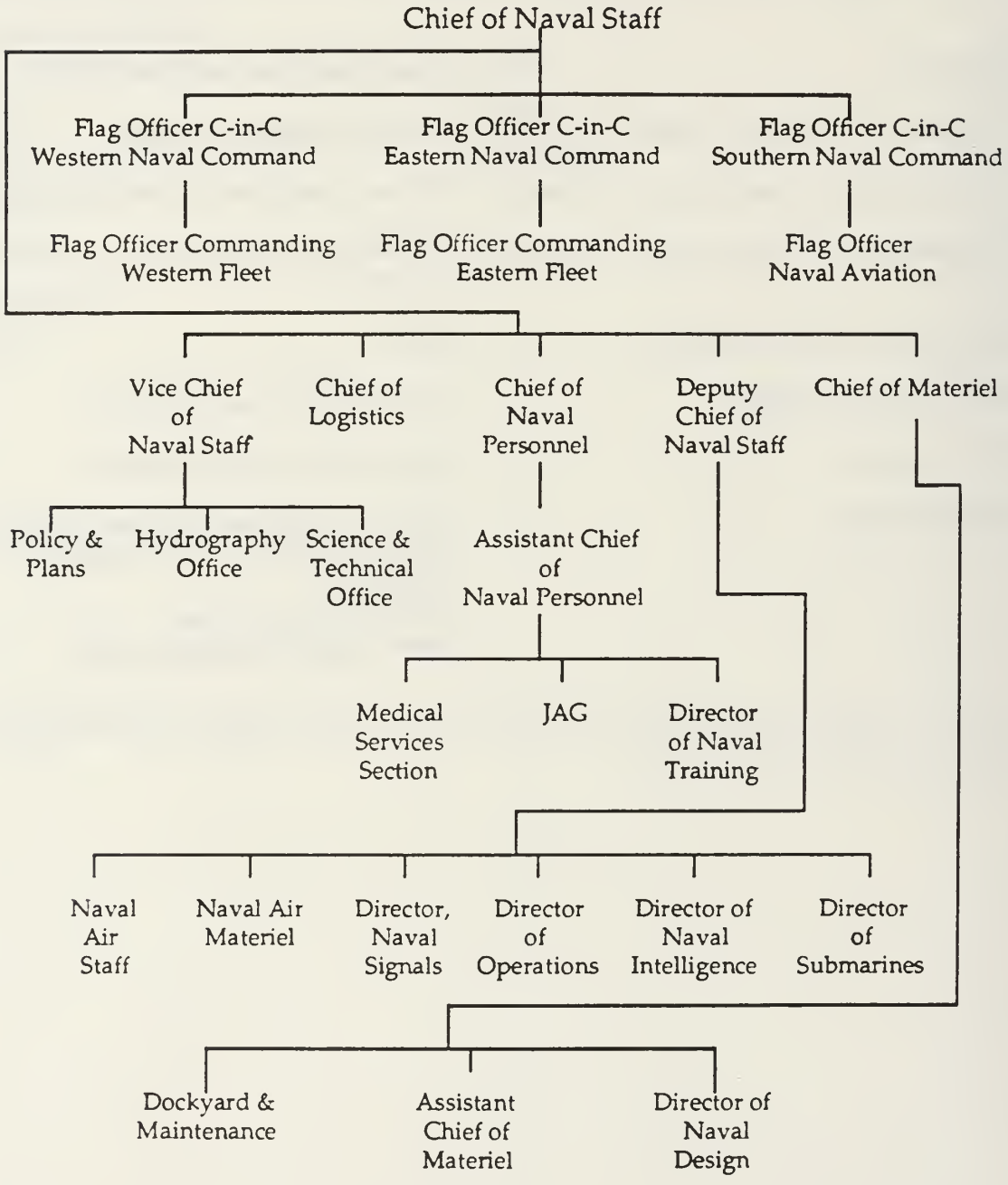
APPENDIX C. MAJOR INDIAN NAVAL BASES AND ESTABLISHMENTS

INS India	Naval Headquarters (New Delhi)
Commander-in-Chief, Western Command	HQ and Dockyard (Bombay)
Commander-in-Chief, Eastern Command	HQ and Dockyard (Vishakhapatnam)
Commander-in-Chief, Southern Command	HQ and naval training; ship repair yard (Cochin)
Flag Officer, Naval Aviation	(Goa)
INS Sea Bird (building)	Planned carrier case (Karwar)
INS Utkrosh	(Port Blair, Andaman Island)
Shipbuilding	Destoyers, frigates, corvettes (Bombay); Frigates, corvettes, LSTs, auxiliaries (Calcutta); Patrol craft, LCU (Goa) Patrol craft (Vishakhapatnam)

NOTE: Additional facilities located in Nicobar and Laccadive island groups.

Source: (Sharpe, 1990, p. 260)

APPENDIX D. INDIAN NAVAL ORGANIZATION



SOURCE: (Jacobs, 1986, p. 122) and (Singh, 1987, p. 18)

APPENDIX E. MAJOR INDIAN DEFENSE R&D ESTABLISHMENTS AND LABORATORIES

AERONAUTICS

Gas Turbine Research Establishment (GTRE)

Aeronautical Development Establishment (ADE)

Aerial Delivery R&D Establishment (ADRDE)

ELECTRONICS

Electronics & Radar Development Establishment (LRDE)

Defence Electronics Research Laboratory (DLRL)

Defence Electronics Applications Laboratory (DEAL)

Instruments R&D Laboratory (IRDL)

Defence Science Centre (DSC)

Solid-State Physics Laboratory (SPL)

Microwave Tube Research and Development Centre (MTRDC)

WEAPON SYSTEMS

Defence R&D Laboratory (DRDL)

Combat Vehicle R&D Establishment (CVRDE)

Armament R&D Establishment (ARDE)

Explosive R&D Establishment (ERDL)

Proof & Experimental Establishment (PEE)

Terminal Ballistics Research Laboratory (TBRL)

NAVAL TECHNOLOGY

Naval Physical & Oceanography Laboratory (NPOL)

Naval Chemical & Metallurgical Laboratory (NCML)

Naval Science & Technological Laboratory (NSTL)

ENGINEERING EQUIPMENT

Defence Terrain Research Laboratory (DTRL)

R&D Establishment (Engineers) (RDEE)

Vehicle R&D Establishment (VRDE)

Snow & Avalanche Study Establishment (SASE)

Defence Institute of Fire Research (DIFR)

MATERIALS

Defence Metallurgical Research Laboratory (DMRL)

Defence Materials and Stores R&D Establishment (DMSRDE)

LIFE SCIENCES

Institute of Nuclear Medicine & Applied Sciences (INMAS)

Defence Bio-Engineering and Electromedical Laboratory (DEBEL)

Defence Institute of Physiology & Allied Sciences (DIPAS)

Defence Institute of Psychological Research (DIPR)

Defence R&D Establishment (DRDE)

SYSTEMS ANALYSIS, TRAINING & INFORMATION

Centre for Aeronautical Systems, Studies & Analyses (CASSA)

Institute for Systems Studies and Analyses (ISSA)

Defence Institute of Works Study (DIWS)

Institute of Armament Technology (IAT)

Defence Scientific Information & Documentation Center (DESIDOC)

SOURCE: (Howarth, 1986, p. 437)

APPENDIX F. PRINCIPAL INDIAN DEFENSE MANUFACTURERS

AEROSPACE

Bharat Electronics Ltd., (BEL)

Carbon Composites Ltd.

Hindustan Aeronautics Limited (HAL)—Several locations and subdivisions

ORDNANCE

36 factories throughout India, divided into

- Ammunition Group
- Weapons Group
- Explosives Group
- Clothing Group
- Vehicles Group

SMALL ARMS AND AMMUNITION

Pune Ammunition Factory

Armament R&D Establishment

Explosive R&D Establishment

Government Small Arms Factory

36 ordnance factories

MILITARY VEHICLES

Avadi Company

Medak Ordnance Factory

Jabalpur Ordnance Factory

Mahindra & Mahindra, Ltd.

MILITARY SUPPORT SYSTEMS

Bharat Earth Movers Limited

Mishra Dhatu Nigam Limited (MIDHANI)

Praga Tools Limited

NAVAL HULL CONSTRUCTION

Garden Reach Shipbuilders & Engineers Ltd. (GRSE)

Goa Shipyards Limited (GSL)

Hindustan Shipyard

Mazagon Dock, Ltd. (MDL)

NAVAL SHIP SYSTEMS COMPONENTS

Bharat Dynamics Ltd.

Bharat Electronics Ltd., (BEL)

Garden Reach Shipbuilders & Engineers Ltd.

Goa Shipyards Limited

Mazagon Dock, Ltd.

C3I AND SURVEILLANCE

Bharat Electronics Ltd., (BEL)

Hindustan Aeronautics Limited

ELECTRONIC WARFARE

Bharat Electronics Ltd.

Hindustan Aeronautics Limited

MISSILE SYSTEMS

Bharat Dynamics Ltd.

Hindustan Aeronautics Limited

SOURCE: (Prakash, 1990, p. 38-39.)

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